Disappearance of the Evening Peak— Showing How Great Increase in Industrial Load Has Bettered Load Factor

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Electrical World

New York, July 28, 1917 McGraw-Hill Publishing Co., Inc. Vol. 70, No. 4 10c a copy

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Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by the McGraw-Hill Publishing Company, Inc.

Vol. 70 NEW YORK, SATURDAY, JULY 28, 1917 No. 4

Financing—Do It Now

A LARGE manufacturing company in the electrical industry sold three-year notes last week. Its credit is rated as the very best, its business and profit are larger than ever before, yet it is selling short-time notes which the bankers disposed of to the public on about a 6.10 per cent interest basis net. A central station company in a leading city has sold a block of securities at a price lower than it would receive in normal times. Its record of earnings is consistently favorable, its management is of the very highest order, yet it gladly marketed securities on a strict war basis. It is not every company which can sell securities in these times. Bankers look closely at the position of a company and its reputation among buyers before they consent to underwrite new issues. When they contract to buy they want only securities which will go like hot cakes in winter. This is because they are competing in the money market with the biggest and safest borrower on earth. This borrower has met current needs. There is a lull now before the next Liberty Loan will come out, and this leaves an opportunity for electrical companies of superexcellent credit to do their financing. Bankers know that plant additions are urgently required to furnish the additional supply of energy which industry demands. Given the securities of the corporation of established credit, the bankers, if the price is sufficiently attractive, will find the market. But the thing must be done quickly.

A Common Forum Needed

WHEN the representatives of central station, manufacturer, jobber, dealer and contractor all get together, the discussion of their common problems is certain to facilitate co-operation and mutual appreciation, and there can be no such co-operation until representatives do so confer, understand one another and agree on fundamentals. There can be no doubt that such discussion will have a direct and important influence on the future business of the interests involved. Among dealers each firm settles its own problems within itself and carries to the association of contractors and dealers the problems common to this part of the industry. So among jobbers each firm is distinct, and yet all can put aside individual matters to get together, through the Electrical Supply Jobbers' Association, on questions affecting that branch of the industry.

Since this plan has proved so helpful to the several branches of the industry, why should not the manufacturer, jobber, dealer, contractor and central station discuss those questions which affect the electrical industry as a whole? The influence of such a combination would be most beneficial to all concerned, and much which could not otherwise be gained could be secured through this unison of action. An organization of this sort cannot be successfully constructed on short notice, and there may be obstacles to overcome. However, the plan is fraught with such great potentialities that sooner or later a way must surely be found to ally these interests. Perhaps it will be that committees from each field, or the association in each field, will regularly sit in common council; but whatever the plan of organization, it absolutely must be such that each of the interests to be allied can be offered proper representation. Only on this basis would it be worth while to attempt such a scheme, and no compromise of this principle could be the basis of a permanent organization. In view of present conditions it would be worth while for a representative committee to make a study of this problem and report on ways and means of co-ordinating the activities of all branches of the electrical industry.

Engineers and War

WAR is a business and must be conducted by business methods. It calls for the hardest collective effort of all the individuals of a nation. The soldiers must be highly trained in advance and must be supplied with warlike instruments of precision. The officers have all to be engineers, in whatever branch they serve, and have to receive an engineering training. The food, clothes, shelter, transport, hospital supplies, tools, guns and munitions of the soldiers have to be supplied by a yet more numerous army of workers behind the lines, and a large amount of engineering is necessary in the work of this non-shooting army. There is no active man or woman in the country but can take a useful part in the war, somewhere between the firing line and the supply line at the rearmost base. Electrical workers, because they have been rendered familiar with engineering in some manner or degree, can be of particular service.

No business plans can be completed until a proper canvass is made of the available personal material. The first thing necessary is to take stock. Every engineer in the country should be registered and his abilities taken into account. A certain number of them must be retained in each industry, in order that that industry shall be properly carried on. The others should be assigned to positions either with the colors or in the special new industries that the war will evoke.

The Engineering Council has already started to approach engineers with a view to ascertaining just what work they can do individually or co-operatively for the government. All must earnestly co-operate for success

in the war, because success means the right of men and of small nations everywhere to live unmolested, so long as they behave themselves. In this work engineers can share and glory.

Getting Coal for the Winter

IT IS the aim of central stations to maintain service without interruption, come what may. A first necessity in carrying out this policy in steam stations is abundant coal supply. Until last winter abundant coal supply meant only enough to protect against the normal possibilities of mine or railroad trouble. It means more now. Neither coal-mining nor railroad conditions are normal, nor can they be expected so to be while the war or post-war activities remain intense. Mining conditions will not be easy, railroad operation will be greatly complicated by flood of traffic. Under these circumstances what can the poor central station property do? The ELECTRICAL WORLD has made a study of conditions in some of the Central Western communities for the purpose of finding whether the problem of next winter's coal supply promises to be both serious and dangerous. It will be both serious and dangerous. To secure plenty of coal at prices that they can afford to pay will tax the sharp ingenuity and latent resources of the companies. The whole of our own country, our allies on this and other continents, the entire world needs coal. Reserve stocks are low, labor is scarce, demands of industry are insatiable. To the current consumption for ordinary purposes there are being added rapidly government requirements of impressive totals.

In other years the movement of coal from the vein in the ground to the central station boiler room has been routine. It will not be that in the winter of 1917-18. Contracts broken by coal dealers, higher prices, prosperous manufacturers who put "price-no-consideration" clauses in coal orders, dearth of labor and, last but not by any means least, slow car movement and the approaching fall traffic congestion are unwelcome portents. Some of these will be lightened, others will be overcome in localities or specific instances, but they will not vanish like dew before the sun. It will take much work to keep the avenues unclogged, to maintain coal supply so that service shall not fail in the community.

It is not our desire to hamper existing agencies which are trying to settle the problem by executive planning and forethought. But in such times as these it takes more than the ordinary detail of purchasing, contract-signing and coal-handling apparatus to get coal in large reserve quantities. Even a central authority decree cannot get coal to a central station in twenty-four hours if a terminal traffic congestion develops which a week of work fails to break. Coal may be loaded on cars by the mine operator, it may be moved toward destination by the railroad, but blinding snowstorms, wrecks and pressure of traffic from connecting lines defy orders which emanate from the occupant of a comfortable armchair 1000 miles away. Some companies were too perilously near bottom in their coal-storage yards last winter to take any greater risks than are necessary.

Fortunately many central station operators are alert to the facts. Washington realizes the need of protecting fuel supply for the utilities which serve the public and speed the war industries. And local state officials are getting a very clear understanding on the subject. Central stations may depend upon it that powerful efforts will be made to supply their wants. But that is not enough. The central stations will have a strong case only after they have made every possible effort to safeguard their own rights. They will have to strain their own powers in collecting coal, in getting it safely stored in their yards. It will take persuasion, cajoling, threats and, most potent of all, cash; but it will have to be done. And the cost ought to be put straightway into the rates.

The Vanishing Peak

IF ONE looks over the series of load curves of any of the older large stations in the country, the most striking feature to impress him is that grim and terrible thing abhorred of managers, the peak. For years the ingenuity of central station men has been racked to devise means of filling up the hollows in the load curve without materially increasing the daily maximum. The answer to the problem has come in the form of industrial load, as Mr. W. N. Neibich's paper in the current issue well shows. The particular station here referred to is that in Baltimore, which is supplied very largely from the great hydroelectric plant on the Susquehanna River at Holtwood.

The result of the last decade's development has been the practical abolition of the conspicuous evening peak. If one discovers a peak at all, it is a very small one superimposed on a colossal range of hills enduring from early in the morning until near midnight, with short and precipitous canyons denoting the time during which people stop work to eat. The situation in Baltimore is a little abnormal in that the peak of eight or ten years ago fell a little later than usual, an index to slight differences in the habits of the people and the hours kept. A glance at Mr. Neibich's charts shows clearly what has happened. Through a drive at industrial load of various kinds, supplied with energy largely at high tension through the customers' substations, the load has been so built up that the peak is substantially a negligible quantity and the load factor has risen from a scant 20 per cent ten years ago to more than 50 per cent at the present time. Whether industrial conditions and the ingenuity of managers will ever combine to fill up the gulf of the early morning hours remains to be seen. This in a system like that of Baltimore is the chief factor in lowering the average load. The success of the Baltimore company in building up this industrial load and its happy effect on the service conditions shows how much may be done by a persistent drive for more power backed by a liberal and carefully adjusted schedule.

It is the possibility of bulk supply to big establishments that renders possible the abolition of the peak, for the high peak was essentially a characteristic of the days in which motor service was a small item in

central station business and lighting was the one load seriously to be considered. Artificial light under any given conditions becomes suddenly necessary at a particular time in the afternoon which does not vary greatly from point to point in the area served; hence all lamps, private and municipal, are lighted within a very short time and the peak rises skyward. This condition brought about by the need of artificial light cannot be avoided, but what can be done and what has been done in the Baltimore case is to take on so large an amount of industrial power load that the additional load due to lighting becomes very nearly negligible. This is a condition greatly to be desired in central station practice, and it is attainable wherever energy can be supplied cheaply enough to meet the industrial demands.

Some Phases of Factory Lighting

WE PRESENT this week another of Professor Clewell's interesting articles on some practical details of lighting. This paper is devoted to the proper illumination of clothing factories and similar workshops. So large a proportion of the world's clothing is made in special factories that that industry rises to great importance not only in the value of the product but in the number of employees. Consequently the effect of good and bad lighting on the workpeople and on the product cannot be passed by. The text of Professor Clewell's article is a government report dealing particularly with the women's garment factories in New York City. This report brings out the serious fact that over 50 per cent of such workshops are inadequately lighted, according to the investigations of the United States Health Department. Those who are familiar with industrial conditions in New York City will, of course, recognize that the situation is probably worse there than almost anywhere else, chiefly on account of the narrow streets, high buildings and the very common location of clothing workshops in lofts selected rather on account of cheap rent than for their effect on the efficiency of the work and the health of the workers.

Even when the exposure of the windows is fairly good, the areas of the working spaces are often so large that the inner portions receive very little light. Of course this situation seriously aggravates the difficulties of artificial lighting, as it is a commonplace of scientific illumination that spaces requiring large aid from artificial light are not easy to deal with, and that natural and artificial light do not, so to speak, mix well from the psychological and possibly the physiological standpoint. With little clear sky to illuminate the windows and with the opposite wall surfaces dingy as they frequently are, poor lighting will be assured except near the windows and for a small portion of the day. Prism glass has been largely used to remedy this condition, but to be effective it has to be kept clean, and city conditions are such that this obligation is rarely fulfilled.

Aside from generally insufficient light, the commonest trouble in such factories as we are here considering is serious glare, both directly from the illuminants and sometimes indirectly from the work as well. This trouble comes from the usual cause of bare or insufficiently shielded lamps. Comparatively few of those controlling this particular industry have as yet seen the economic importance of good lighting, and innumerable cases may be found where bare gas burners or incandescent lamps are hung low and shine fairly in the faces of the workpeople. In not a few other instances the lamps originally in the installation may have been tolerably well shaded, but later changes have placed, for example, a 100-cp. tungsten lamp in a shade suitable for a 16-cp. carbon lamp, with the result that might be expected.

With the variety of first-class glass and steel reflectors now available there is very little excuse for glare, although in rare instances the situation of the working spaces is such that ordinary reflectors prove somewhat inadequate. In this case special reflectors may advantageously be used, and we have even seen thoroughly good results on a cutting table obtained from the original lamp and reflectors by adding a diffusing skirt deep enough to keep direct light out of the operator's eyes. The importance in the clothing industry of a good and uniform product turned out rapidly is such as to justify considerable expenditure in remedying imperfect lighting conditions. These are bad enough in dealing with white fabrics, but when dark-colored cloths are used the situation becomes much worse. As between white goods and dark blues, reds or blacks the illumination required for efficient working is somewhat in the ratio of one to four or five. For the former between 1 ft.-candle and 2 ft.-candles for ordinary work seems to be reasonably sufficient; for the latter 5 to 7 ft.-candles will prove to be none too much. Professor Clewell's data show very clearly that there is great need for reform in the lighting of clothing factories. Now and then, as he indicates, a very admirable example may be found in which the working conditions as well as the product are of the best, but such conditions are unfortunately exceptional.

The Coming Issues

AS THE question of coal supply and cost enters so prominently into the question of expense of operation and is a part of the larger problem of rate-making, special attention will be given to it in the ELECTRICAL WORLD for Aug. 4. This issue will present several articles dealing with matters of public policy which are receiving analysis and consideration in various parts of the country. The coal situation demands the best thought of operators in order that the serious difficulties of last winter may be overcome or minimized in the coming season, and the ELECTRICAL WORLD will do what it can to assist in solving the problems involved. Prof. C. E. Clewell's article in the same issue will discuss local lamp and inspection work lighting. The usual departments will be found to be of much interest to engineers and operators, new-business representatives and manufacturers, jobbers and others.

The Disappearance of the Evening Peak

Growth of High-Tension Industrial Load in Baltimore Results in Heavy Increase in Morning and Afternoon Loads on System and in a Larger Load Factor

BY WILLIAM N. NEIBICH

THE central station industry of the country is now experiencing one of the greatest booms in its history, and the industry in Baltimore is proving no exception. For the first three months of the year 1917 there was an increase in the output of electricity throughout the country of 23.7 per cent over the corresponding months of last year. The increase of the Consolidated Gas, Electric Light & Power Company of Baltimore during the same period was 41.9 per cent. Of this increase 73 per cent was due to high-tension industrial load.

This load has grown to such an extent in recent years that it has practically caused the disappearance of the evening peak load. There are only about six weeks of the year, from the second week in December to the third week in January, when this does not apply. During this time the lighting load and the industrial load overlap owing to the shortened hours of the day.

In order to show this changed condition of the company's load, curves of load on days in 1909, 1914 and the present year are shown. The load curves of 1909 were taken because this was about the time the idea of central station service for large industrial requirements was put into practice. Those of 1914 show the great stride made in the increase of industrial load and central station service after a period of five years. The load curves of the present day show the further increase of industrial load and the changed characteristics of the total system load.

LOAD CONDITIONS FOR THE YEAR 1909

Fig. 1 shows the load of May 1, 1909, plotted hourly. Curve A represents the total load generated, 25 cycles, 13,200 volts, and curve B the amount sent to distribution lines from the company's various substations. The difference between A and B represents substation loss and transmission-line loss between substations. The peak load on the system on this day was 12,600 kw., occurring between 8 p. m. and 9 p. m., the load factor being 42.9 per cent.

The business section of the city is supplied underground with 120-240-volt direct-current service. Referring to curve C, Fig. 1, it will be seen that the peak of this class of service was between 8 p. m. and 9 p. m. and was a contributing factor of the system peak. Most of the service in this district at this time was supplied to office buildings and stores, the major portion of the load of which was lighting. The public at this time was skeptical in regard to the advantages of central station service, and there were many manufacturers and small factories with isolated plants.

The load of the residential section of the city was purely lighting, although in some sections power was used for operating small pumps. This class of service, which is 60-cycle alternating current, also contributed heavily toward the system peak, as can be seen by curve D, Fig. 1. Its peaks also occurred between 8 p. m. and 9 p. m. The municipal lighting also was a factor in the system peak. The forenoon and afternoon peaks on this day, representing largely power load, were only about one-half of the evening peak, which was almost entirely lighting.

In 1908 the company established a scientific schedule of differential rates which were attractive to power consumers. Following the introduction of differential electric rate schedules, there began an unprecedented growth in the company's output and an unusual diversity of business.

INAUGURATION OF HIGH-TENSION SERVICE TO CONSUMERS

High-tension service in the form of 25-cycle, 13,000-volt, three-phase alternating current was supplied to consumers and metered at the company's station switchboard during the latter part of 1907. Later this service was extended so that consumers were metered at the consumer's switchboard, the company standing the transmission-line loss to the consumer's substation. This class of service proved very attractive to industrial concerns and developed very rapidly.

The first customer of this character was the Maryland Electric Railways, which was formerly a steam road operating between Baltimore and Annapolis, Md., a distance of about 30 miles (55.6 km.). This road was first operated as a single-phase system, but later the equipment was changed to a 1200-volt direct-current system. High-tension service was supplied to its substations.

Later other concerns contracted for high-tension power of the 25-cycle, 13,000-volt form. Among these was the Baltimore & Ohio Railroad, which used the power to move the trains in its belt-line tunnel beneath the city of Baltimore. The Baltimore Copper Smelting & Rolling Company was another of these concerns. Its power requirements were for the purpose of refining copper by an electrolytic process. Then followed textile mills for the making of cotton duck.

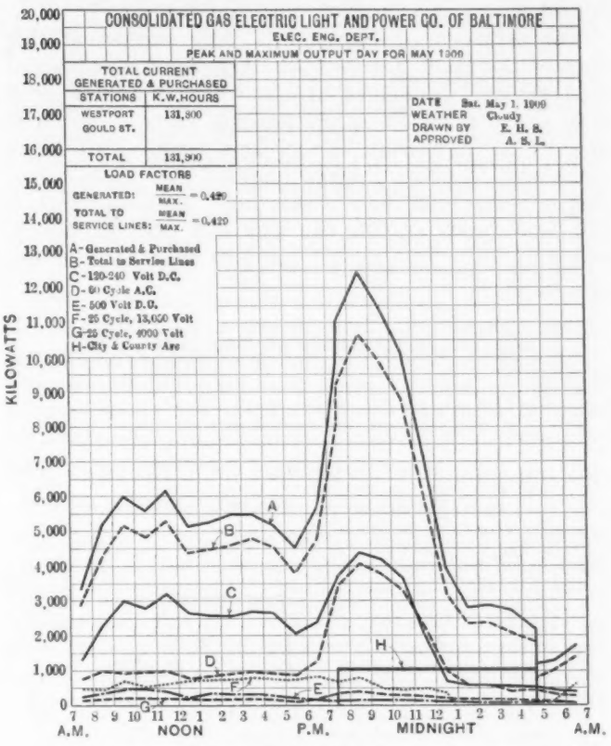
Curve F, Fig. 1, shows the load of this class of service on May 1, 1909, the only customer supplied at this time being the Maryland Electric Railways. This load was only 6 per cent of the total system load during the peak hour.

LOAD CONDITIONS FOR THE YEAR 1914

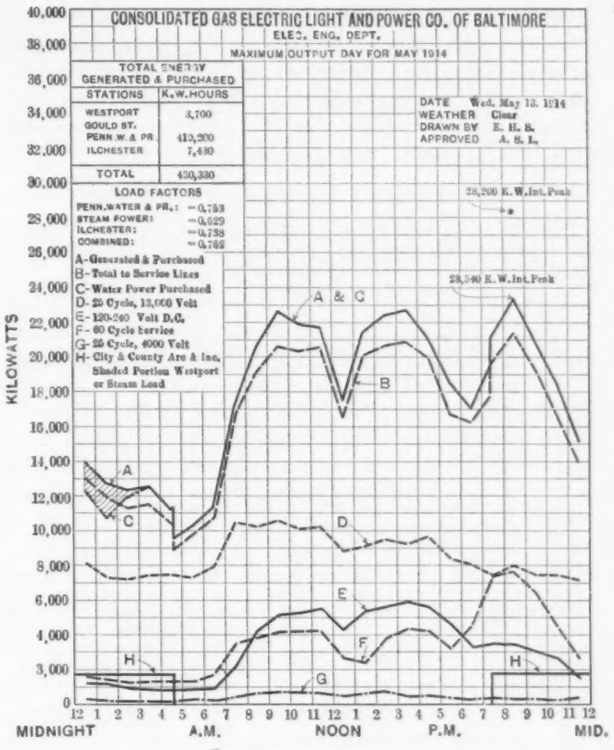
Fig. 2 shows the total system load and that of the various classes of service on May 13, 1914, five years later. By comparing these curves with those of Fig. 1, a marked difference in the character of the load will be noticed, the forenoon and afternoon peaks being nearly equal to the evening peak. The diversity of business here is very marked. The lighting load still was the contributing factor toward the system peak, which occurred between 8 p. m. and 9 p. m. This is shown by curve F, 60-cycle alternating-current service, which supplies the residential section and outlying districts of the city.

The direct-current service supplying the business district (curve E, Fig. 2), however, had assumed a different

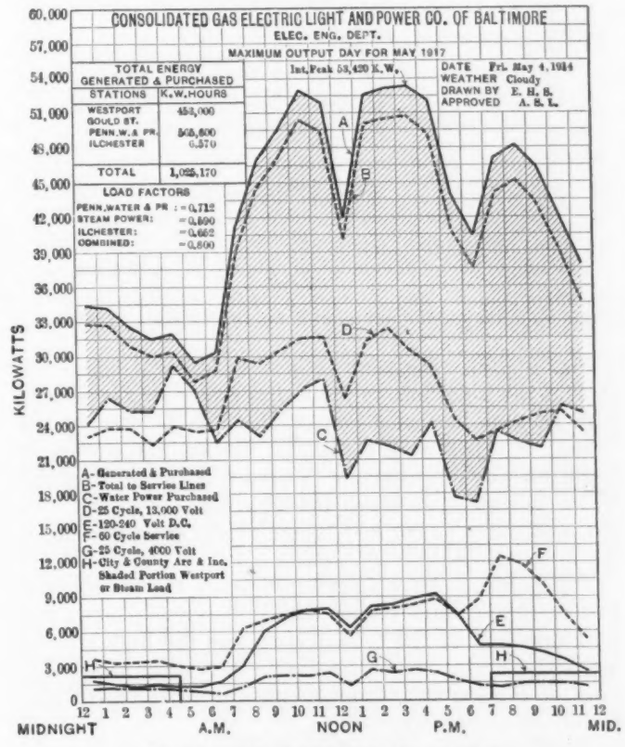
character from that shown in Fig. 1. The peak on this class of service occurred between 3 p. m. and 4 p. m. plants in this district. A large amount of power load was thus added to the central station system.


CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO. OF BALTIMORE
ELEC. ENG. DEPT.
PEAK AND MAXIMUM OUTPUT DAY FOR MAY 1909
TOTAL CURRENT GENERATED & PURCHASED
STATIONS K.W.HOURS
WESTPORT GOULD ST. 131,900
TOTAL 131,900
LOAD FACTORS
GENERATED: MEAN/MAX. = 0.429
TOTAL TO SERVICE LINES: MEAN/MAX. = 0.429
DATE Sat. May 1. 1909
WEATHER Cloudy
DRAWN BY E. H. S.
APPROVED A. S. L.
A-Generated & Purchased
B-Total to Service Lines
C-120-240 Volt D.C.
D-60 Cycle A.C.
E-500 Volt D.C.
F-25 Cycle, 13,000 Volt
G-25 Cycle, 4000 Volt
H-City & County Arc
KILOWATTS
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7
A.M. NOON P.M. MIDNIGHT A.M.

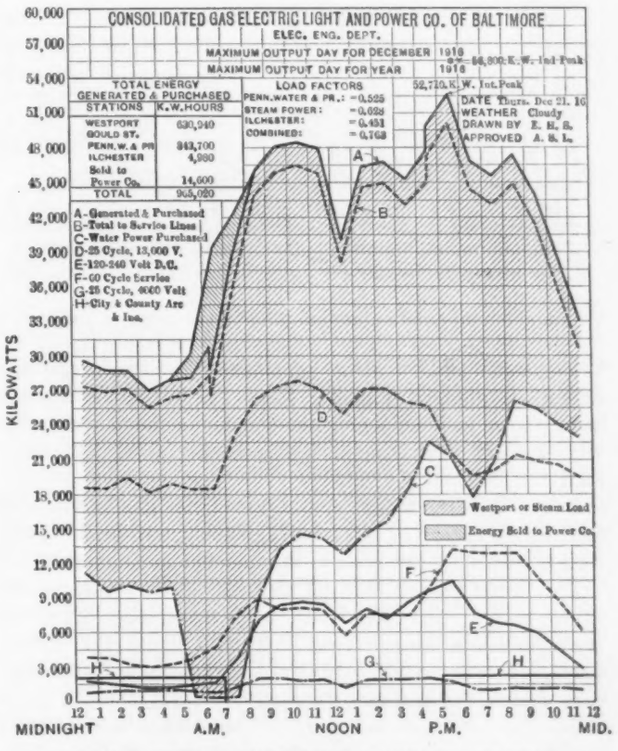
WHEN POWER RATE WAS FIRST INTRODUCED


CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO. OF BALTIMORE
ELEC. ENG. DEPT.
MAXIMUM OUTPUT DAY FOR MAY 1914
TOTAL ENERGY GENERATED & PURCHASED
STATIONS K.W.HOURS
WESTPORT 3,700
GOULD ST.
PENN.W.& PR. 413,200
ILCHESTER 7,430
TOTAL 430,330
LOAD FACTORS
PENN.WATER & PR.: = 0.733
STEAM POWER: = 0.629
ILCHESTER: = 0.738
COMBINED: = 0.702
DATE Wed. May 13. 1914
WEATHER Clear
DRAWN BY E. H. S.
APPROVED A. S. L.
28,200 K.W. Int. Peak
23,540 K.W. Int. Peak
A-Generated & Purchased
B-Total to Service Lines
C-Water Power Purchased
D-25 Cycle, 13,000 Volt
E-120-240 Volt D.C.
F-60 Cycle Service
G-25 Cycle, 4000 Volt
H-City & County Arc & Inc.
Shaded Portion Westport or Steam Load
KILOWATTS
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
MIDNIGHT A.M. NOON P.M. MID.

FIVE YEARS LATER


CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO. OF BALTIMORE
ELEC. ENG. DEPT.
MAXIMUM OUTPUT DAY FOR MAY 1917
TOTAL ENERGY GENERATED & PURCHASED
STATIONS K.W.HOURS
WESTPORT GOULD ST. 453,000
PENN.W.& PR. ILCHESTER 565,800 0.570
TOTAL 1,025,170
LOAD FACTORS
PENN.WATER & PR.: = 0.712
STEAM POWER: = 0.690
ILCHESTER: = 0.662
COMBINED: = 0.690
Int. Peak 53,420 K.W.
DATE Fri. May 4. 1914
WEATHER Cloudy
DRAWN BY E. H. S.
APPROVED A. S. L.
A-Generated & Purchased
B-Total to Service Lines
C-Water Power Purchased
D-25 Cycle, 13,000 Volt
E-120-240 Volt D.C.
F-60 Cycle Service
G-25 Cycle, 4000 Volt
H-City & County Arc & Inc.
Shaded Portion Westport or Steam Load
KILOWATTS
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
MIDNIGHT A.M. NOON P.M. MID.

LOAD CHARACTERISTICS OF TO-DAY


CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO. OF BALTIMORE
ELEC. ENG. DEPT.
MAXIMUM OUTPUT DAY FOR DECEMBER 1916
MAXIMUM OUTPUT DAY FOR YEAR 1916
TOTAL ENERGY GENERATED & PURCHASED
STATIONS K.W.HOURS
WESTPORT 530,940
GOULD ST.
PENN.W.& PR. 343,700
ILCHESTER 4,980
Sold to Power Co. 14,600
TOTAL 905,020
LOAD FACTORS
PENN.WATER & PR.: = 0.525
STEAM POWER: = 0.628
ILCHESTER: = 0.431
COMBINED: = 0.763
52,710 K.W. Int. Peak
DATE Thurs. Dec 21. 16
WEATHER Cloudy
DRAWN BY E. H. S.
APPROVED A. S. L.
A-Generated & Purchased
B-Total to Service Lines
C-Water Power Purchased
D-25 Cycle, 13,000 V.
E-120-240 Volt D.C.
F-60 Cycle Service
G-25 Cycle, 4000 Volt
H-City & County Arc & Inc.
Westport or Steam Load
Energy Sold to Power Co.
KILOWATTS
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
MIDNIGHT A.M. NOON P.M. MID.

CURRENT WINTER CONDITIONS OF SHORT DURATION

FIGS. 1 TO 4—CURVES SHOWING DESIRABLE EFFECT OF POWER RATE ON THE LOAD CURVE

This showed the results of proving to power consumers the advantages of central station service and consequently the elimination of a great number of isolated

Curve D, Fig. 2, shows the great stride made in acquiring high-tension industrial power load. This class of service averaged in 1914 about 44 per cent of

the total load. The peak occurred between 9 a. m. and 10 a. m. The load factor on this class of service was unusually high, being about 85 per cent. This was due to industries employing electrochemical processes and other industries using twenty-four-hour service of high load factor, which helped to improve the system load factor materially. The daily system load factor in 1914 (Fig. 2) was 76.2 per cent as compared with that of 1909 (Fig. 1), 42.9 per cent.

PRESENT LOAD CONDITIONS

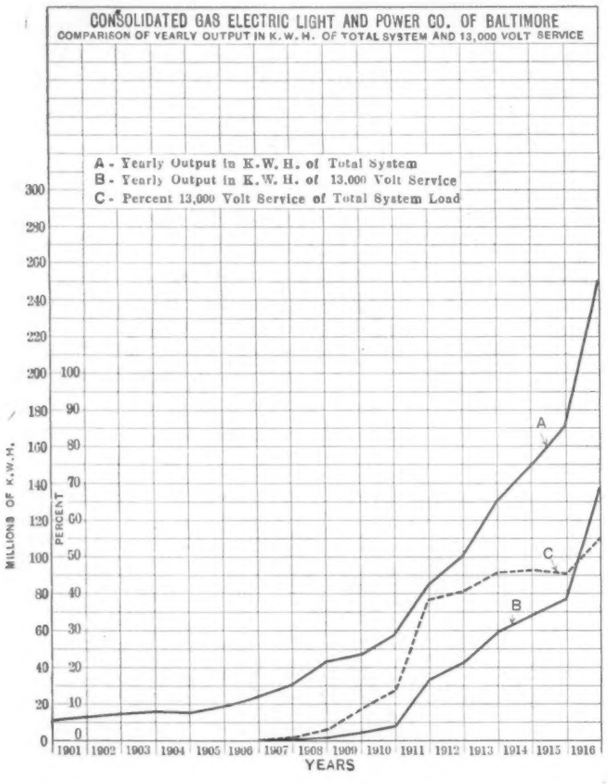
Fig. 3 gives the load of the present day and shows the practical disappearance of the evening peak load. The lighting load is no longer the controlling factor in the system peak, being supplanted by the large increase in industrial load. Here the curves E and F have about the same characteristics as those shown in Fig. 2, but constitute a less percentage of the total load.

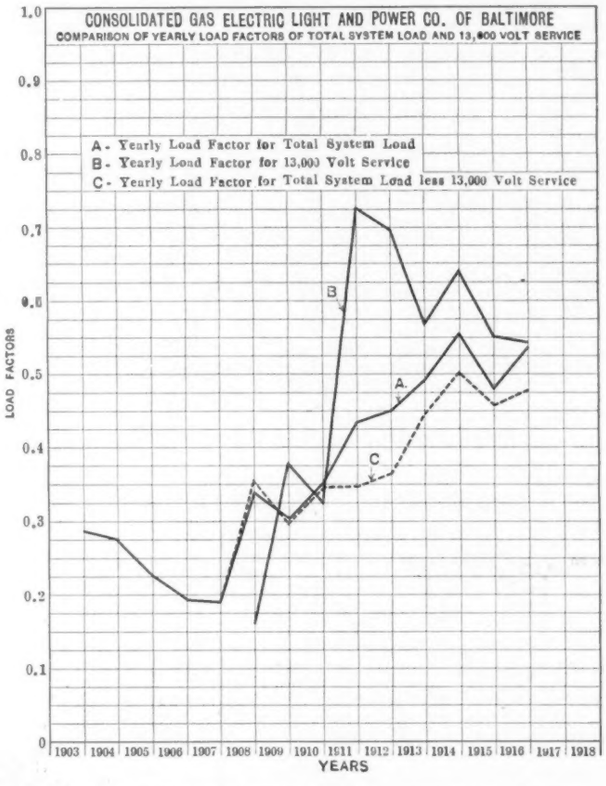
Curve D of the 25-cycle, 13,000-volt service is now the controlling factor in determining the system peak. This load is about 60 per cent of that of the total system.

Fig. 4 shows the load on Dec. 21, 1916. The conditions on this day were not very materially different from those in May. They last only about six weeks during the year, and show that the May conditions hold very nearly throughout the year.

The peak on this day occurred between 5 p. m. and 6 p. m. and was caused by the overlapping of the afternoon and evening peaks. This combined peak, however, is only about 4000 kw. more than that of the morning, which occurred between 10 a. m. and 11 a. m. This is an increase of only about 8 per cent. Of this 2300 kw., or more than one-half, was due purely to municipal street lighting, which necessarily must be started earlier because of the shortened hours of the day. The remainder of the increase was due to the residential and business sections. It is shown by curves E and F.

The diversity of business is very marked at this time of the year. Curve D, the high-tension industrial load, shows a falling off of about 4000 kw. between 5 p. m and 6 p. m., while the lighting loads of curves E and F are increasing during this time. This helps materially to offset a large increase due to the overlapping effect and maintains a high daily load factor. The load factor on this day was 76.3 per cent, which was a decrease of only 3.7 per cent from that of the day in May.


CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO. OF BALTIMORE
COMPARISON OF YEARLY OUTPUT IN K.W.H. OF TOTAL SYSTEM AND 13,000 VOLT SERVICE
A - Yearly Output in K.W.H. of Total System
B - Yearly Output in K.W.H. of 13,000 Volt Service
C - Percent 13,000 Volt Service of Total System Load
MILLIONS OF K.W.H.
PERCENT
YEARS
1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916


CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO. OF BALTIMORE
COMPARISON OF YEARLY LOAD FACTORS OF TOTAL SYSTEM LOAD AND 13,000 VOLT SERVICE
A - Yearly Load Factor for Total System Load
B - Yearly Load Factor for 13,000 Volt Service
C - Yearly Load Factor for Total System Load less 13,000 Volt Service
LOAD FACTORS
YEARS
1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918

FIGS. 5 AND 6—THE GREAT GROWTH IN OUTPUT AND LOAD FACTOR HAS PRIMARILY BEEN DUE TO INDUSTRIAL SERVICE

Fig. 5 shows the total output in kilowatt-hours per year of the high-tension industrial power load compared with that of the total system load. It points out the extent to which this industrial service has grown in importance in recent years. Curve A is the total output of the company; curve B the 25-cycle, 13,000-volt output, and curve C the percentage of the total system of the 25-cycle, 13,000-volt service.

Fig. 6 shows for a number of years the yearly load factors of the total system, the high-tension industrial load, and that of the total system less the high-tension industrial load. It will be easily seen what effect this class of service had in improving the total yearly load factor of the system.

The increase in industrial power has been largely caused by additions and growth in the following industries: fertilizer, coal piers, grain elevators, textile mills, steel companies, shipbuilding and allied interests, and industries using electric furnaces and electrochemical processes.

The industrial advantages of Baltimore, such as low

freight rates, splendid harbor, deep-water terminals for railroads, close proximity to coal mines, steamship lines, and magnificent piers for the quick handling of coal and other exports, in addition to the cheap power rates, have all been a factor in the industrial growth of Baltimore in recent years.

At the present time Baltimore is undergoing the greatest industrial growth in its history. Substantial investments are being made almost daily in new enterprises or by established concerns moving into this community. The conditions now are more favorable than ever before to central station service, owing to increased demand for power and the high cost of coal, supplies, labor and all equipment for isolated plants. Manufacturers in general have been turning to electric public service companies to supply permanent power requirements rather than submit to the delays, uncertainties and unnecessary investment in providing individual power plants. They realize also that both for low cost of power and for reliability central station service is most advantageous.

FUTURE LOAD CONDITIONS

The immediate outlook for the future comprises large additional outputs for new grain elevators, steel companies, new shipbuilding concerns and textile mills. The estimated future increase in the industrial load will further increase the forenoon and afternoon peaks and make the elimination of the evening peak more pronounced than at the present time.

ELECTRIC POWER IN BITUMINOUS COAL MINES

Kind of Power System and Apparatus, Effect of Requirements of Haulage on Selection, and Need of Good Ventilating Equipment

The best form of electric power to use in a bituminous coal mine was discussed by R. L. Kingsland in his paper submitted at the recent "war" convention of the American Institute of Electrical Engineers, held in New York City.

For the larger mines a three-phase, 60-cycle system with voltage high enough to permit a 10 per cent power loss is the most practical scheme. Three hundred volts with an allowable fluctuation of 10 per cent is being favored for underground portable machines, whereas medium or high voltages can be used to advantage safely for stationary machines if proper protection is afforded. Haulage is one of the chief factors determining the form of electric power to use underground. As no practical means has been developed for heavy haulage by the use of alternating currents, it is necessary to use direct current. Synchronous converters delivering 300-volt direct current can be installed above and below the ground where necessary, thus reducing the amount of copper required in the mine to a minimum. In small mines where locomotive haulage cannot be used to advantage all machinery may be run with alternating current if it is available.

In actual practice it has been found that more copper is required for a three-phase alternating-current circuit than for a direct-current circuit of the same voltage, this being largely due to the lagging power factor caused by induction-motor loads. For concentrated loads of 100 hp. or over the author has found that separate lead-covered, steel-armored cables leading direct from the surface through special bore holes are very satisfactory for supplying alternating current for pressures up to 11,000 volts. For underground distribution bare copper wire is used extensively.

With proper voltage the squirrel-cage induction motor is ideal for driving the chain machines used for cutting coal. However, shunt or compound-wound motors are most frequently used for reasons given below. For drilling machines a constant-speed motor is required. A high starting torque is not necessary. Motors for coal-loading machines should have the same characteristics as those for coal-cutting machines. For the small pumps used for delivering drainage water to one or more central points the same form of power should be used as is employed for cutting, drilling and loading. The larger pumps used to remove the water from these central points should be treated as concentrated loads. Underground lighting can be most easily accomplished by the power that is used for other purposes where the lamps are required.

Shop drive and lighting should depend on the primary source of power, as they may be required when everything else about the mine is shut down. They should not depend on the operation of any more machinery than is absolutely necessary.

Ventilation is of first importance in a great many bituminous coal mines, so it is necessary to have very reliable equipment. The squirrel-cage induction motor is especially suitable for this service as it is the most rugged as well as the simplest form of electric motor. If alternating-current power is not available, shunt motors should be used, but the commutators prevent their giving the same reliable service as the induction motors.

METHOD OF FRACTIONATING HYDROCARBONS ELECTRICALLY

Fractionation Takes Place Under a Controllable Pressure Within a Retort, the Pressure Being Variable to Suit the Oil Used

Leon E. Hirt of Charleston, W. Va., in patent No. 1,222,402, suggests a method for fractionating hydrocarbons electrically which consists essentially in passing a spray or mist of oil and steam through an arc between the electrodes. The fractionation or refractionation takes place under a controllable pressure within the retort, which pressure will vary to suit the characteristics of the particular grade of oil used. A pump maintains the oil pressure to the desired intensity, and as the spray or mist of oil and steam passes through the arc and is partly broken up and fractionated by the intense heat of the arc a pressure is built up within the retort. This pressure is held back and is controlled by means of a valve in the offtake pipe. This pipe leads to any suitable condenser or rectifier. Any oil which passes the arcs untreated is trapped off into a tank, whence it may be pumped back for retreatment or otherwise disposed of.

The steam introduced with the oil is decomposed into $2H_2 + O_2$, the nascent H_2 entering into the reaction with the oils, and by holding the desired pressure in the furnace chamber any thermochemical compound of the oils can be formed.

Lighting in the Textile and Clothing Industry

Effect of Height of Adjacent Buildings, Angle of Incidence of Sunlight on Windows and Reflection Coefficient of Cloth Surfaces on Artificial Light Requirements—Actual Cases Illustrated

BY C. E. CLEWELL

Assistant Professor of Electrical Engineering, University of Pennsylvania

SUMMARY.—In this article the author points out the inadequacy of much of the artificial lighting in this field by citing investigations in certain garment industries where insufficiency of illumination as well as the prevalence of harmful glare has been especially noticeable. Since many garment industries are situated in loft buildings, their lighting requirements are considerably affected by the height of adjacent buildings which cut off portions of the sky that would otherwise be visible. On the lower floors so much light may be cut off that artificial lighting is required the greater portion of each day. The upper floors, however, being open to a wider angle of the sky, may receive sufficient natural light to make artificial illumination unnecessary for so long a period. In this same general connection, the angle of incidence with which the light from the sky falls on lateral window surfaces is shown to have a pronounced effect on the light transmitted through the glass into the interior spaces of the building. The angle of glare is defined, and one method is pointed out for its calculation in a given case. Among the most important parts of the article are the treatment of the relation of the reflection coefficient of cloth surfaces to the amount of illumination required for various colors of goods worked upon and the conclusions as to the intensities required. A number of illustrations of actual installations serve as the basis for a reference to the engineering details of the illumination in these trades.

AN EXTENDED investigation of lighting conditions in the women's garment factories in New York City[1] has shown that over 50 per cent of the plants are inadequately lighted. This statement is based on conditions found in thirty-four workshops in which actual measurements were made of the illumination on 404 working planes, representative of six classes of work. Table I shows the summary of these readings.

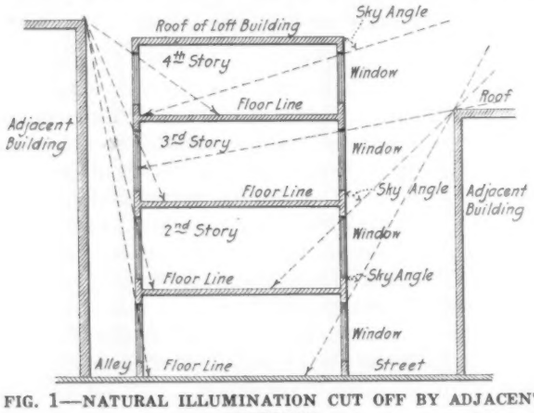
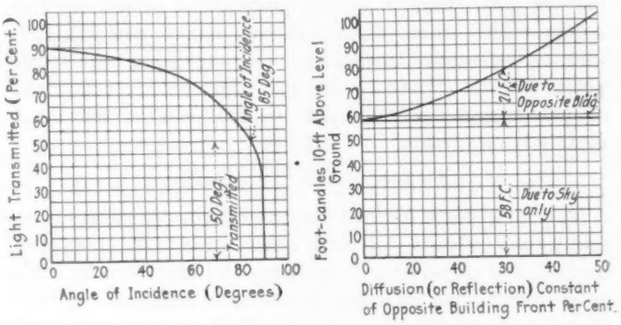


FIG. 1—NATURAL ILLUMINATION CUT OFF BY ADJACENT BUILDING

The term "inadequate" as here used is based on the minimum requirement of 5 ft.-candles, which is advocated in a government report based on the tests referred to above.

Another important finding in this investigation was the marked prevalence of glare from artificial light sources. On 131 finishing tables, for example, employing 610 finishers, glare effects were noted in the case of nearly 98 per cent of the artificial sources which were in operating condition. Again, at the basting tables, glare effects were present in 94 per cent of the artificial sources employed. The causes of glare noted were the use of bare incandescent lamps or flat gas burners, flat reflectors, lamps too large for the reflectors, and the close proximity of the lamps to the table surfaces, bringing the lamps frequently into the line of vision.


Light Transmitted (Per Cent.)
Angle of Incidence 85 Deg.
50 Deg. Transmitted
Angle of Incidence (Degrees)
Foot-candles 10-ft Above Level Ground
71 F.C. Due to Opposite Bldg.
58 F.C. Due to Sky only
Diffusion (or Reflection) Constant of Opposite Building Front Per Cent.

FIGS. 2 AND 3—RELATION OF LIGHT TRANSMISSION THROUGH GLASS TO VARIOUS ANGLES OF INCIDENCE; AND ILLUMINATION IN A SIDE WINDOW 10 FT. ABOVE THE GROUND

In Fig. 3 are shown the proportions of total illumination due to the sky and due to possible diffusion (or reflection) from opposite buildings. Reflection from street surfaces is neglected. The upper curve corresponds to the first three diffusions (or reflections) from the opposite building.

TABLE I—CASES OF ADEQUATE AND INADEQUATE ILLUMINATION* IN WOMEN'S GARMENT INDUSTRIES, NEW YORK CITY

Class of Work	Cases of Adequate Illumination in per Cent	Cases of Inadequate Illumination in per Cent
Manufacturing departments:		
Cutting tables	37.7	62.3
Machines	55.5	44.5
Basting tables	16.6	83.4
Finishing tables	49.7	50.3
Pressing boards	42.3	57.7
Buttonhole machines	45.0	55.0
Stairways	27.0	73.0
Designing departments:		
Cutting tables	62.5	37.5
Machines	93.8	6.2
Finishing tables	83.3	16.7
Pressing boards	62.5	37.5
General averages	47.4	52.6

*Based on a minimum requirement of 5 ft.-candles for all cases except stairways, the minimum requirement for the latter being assumed as 0.1 ft.-candle.

The reason for emphasizing at the outset this report on the lighting conditions in women's garment factories is to show that there is still much need for improvement in this branch of the lighting field. There is, however, no special reason for selecting this particular industry other than the existence of available data relating thereto which form a convenient basis for the

[1] A bulletin containing the results of this investigation has been issued by the United States Health Service entitled "Studies in Vocational Diseases," by J. W. Schereschewsky and D. H. Tuck (May, 1915). Tables I, II and IV are taken from this report.

foregoing conclusions as well as for some of the notes in the following paragraphs.

EFFECT OF ADJACENT BUILDINGS

The presence of adequate daylight throughout normal day-working hours determines whether artificial lighting is to be required. While the ratio of window area to floor area is one way of specifying the natural lighting facilities, it is by no means a complete specification, because for a given window area the amount of natural illumination on interior working surfaces depends on a number of variable factors. Among these there may be mentioned the area of sky which is effective on the window surfaces. This depends on the sky angle as shown by Fig. 1, and it will be noted from this diagram that the sky angle depends on the height and proximity of the adjacent buildings and on the vertical dimensions of the given window, and it also varies considerably with the various floors.[2]

TABLE II—RANGE* OF SKY ANGLE FOR FRONT AND BACK WINDOWS AND FOR SIDE WINDOWS IN WORKROOMS OF THE WOMEN'S GARMENT INDUSTRIES IN NEW YORK CITY

Limits of Sky Angle, Deg.	Front and Back Windows		Side Windows	
	Number of Cases	Per Cent	Number of Cases	Per Cent
0 to 10	158	30.83	74	43.22
10 to 20	7	1.37	6	3.55
20 to 30	13	2.54	.....	....
30 to 40	32	6.25	.....	....
40 to 50	16	3.12	.....	....
50 to 60	89	17.41	.....	....
60 to 70	44	8.59	.....	....
70 to 80	27	5.27	32	18.71
80 to 90	126	24.62	59	34.52
Totals.....	512	100.00	171	100.00

*Note that the sky angle is less than 10 deg. in about 30 per cent of the cases and less than 60 deg. in about 60 per cent, for the front and back windows.

The significance of a large sky angle may be observed at the right-hand window for the third floor in Fig. 1, which indicates that the sky is visible from any point on the floor, and hence the natural illumination is effective on the entire third-floor area (also, of course, on the fourth floor), because of the right-hand windows. On the first and second floors, however, the windows receive light from such a small portion of the sky that only a section of each floor receives light directly from the sky. Table II gives an idea of the range of sky angles for 512 front and rear windows and 171 side windows in workrooms of New York City. Note in this table the large percentages of windows for which the sky angle is very low.

TABLE III—ILLUMINATION* AND CORRESPONDING SURFACE BRIGHTNESS REQUIRED TO MAKE THREADS VISIBLE

Material	Illumination in Foot-Candles Required to Make the Threads Visible	Corresponding Surface Brightness in Foot-Candles
(Observer WCDW)		
(a) Very light blue calico.....	1.40	0.70
	1.65	0.90
	1.40	0.70
(b) Light blue calico.....	2.00	0.75
	1.70	0.70
(c) Full blue calico.....	4 80	0.63
	5.80	0.86
(d) Dark blue calico.....	12.00	0.62
	12.50	0.68
(Observer BPD)		
(a) Very light blue calico.....	1.00	0.64
	0.80	0.52
(b) Light blue calico.....	1.90	0.72
	1.30	0.50
(c) Full blue calico.....	4.00	0.52
	3.60	0.48
(d Dark blue calico.....	10.50	0.60
	14.00	0.85

*Determined by gradually raising the intensity from a low value to higher values.

Among the effects of small sky angles are, first, the reduced sky area which illuminates the interior floor space and, second, the large angles of incidence with which the light from the sky falls on the glass of the lateral windows. For the large angles of incidence the light transmitted through the glass may be greatly reduced as indicated by Fig. 2 for plain-glass surfaces. It is apparent from Fig. 1 that where very small sky angles occur, as in the lower floors, the interior of the building (principally on first floors) must depend largely for natural light on the reflection from opposite walls or from the street surfaces. Fig. 3 is therefore included to show the increase in natural illumination which may be expected for various diffusion or reflection constants of opposite building faces.[3] This curve sheet is based on a distance between buildings of 80 ft. (24.3 m.) and a height of 140 ft. (42.7 m.) for the opposite building, the brightness of the sky being assumed as equal to 250 cp. per square foot (2690 cp. per sq. m.).

TABLE IV—REFLECTION COEFFICIENTS OF MATERIALS COMMONLY WORKED UPON IN WORKSHOPS OF THE WOMEN'S GARMENT TRADES IN NEW YORK CITY

Class of Goods	Reflection Coefficient in per Cent
Black velvet	0.37
Navy blue woolen cloth (dark)	1.70
Black woolen cloth	1.90
Navy blue woolen cloth (light)	2.20
Green, Russian woolen or cotton (dark)	2.30
Brown woolen cloth (dark)	2.30
Black cotton cloth	2.90
Black silk and mercerized cotton	4.50
Green woolen or cotton (light)	5.40
Brown woolen cloth (light)	10.90
Tango cloth, woolen or cotton	14.30
Light brown paper patterns	35.10
White cloth*	65.90

*Measured as a double thickness on a golden-oak surface.

The curve in Fig. 3 makes it obvious that if the sky angle is very small and the opposite building surface is very dark in color, the natural lighting on the floor in question is likely to be very poor at all times, and unless some special provision is made to redirect the natural light from the sky more effectively to the interior—for example, by prisms—the work must depend largely on artificial illumination.

PREVALENCE OF GLARE

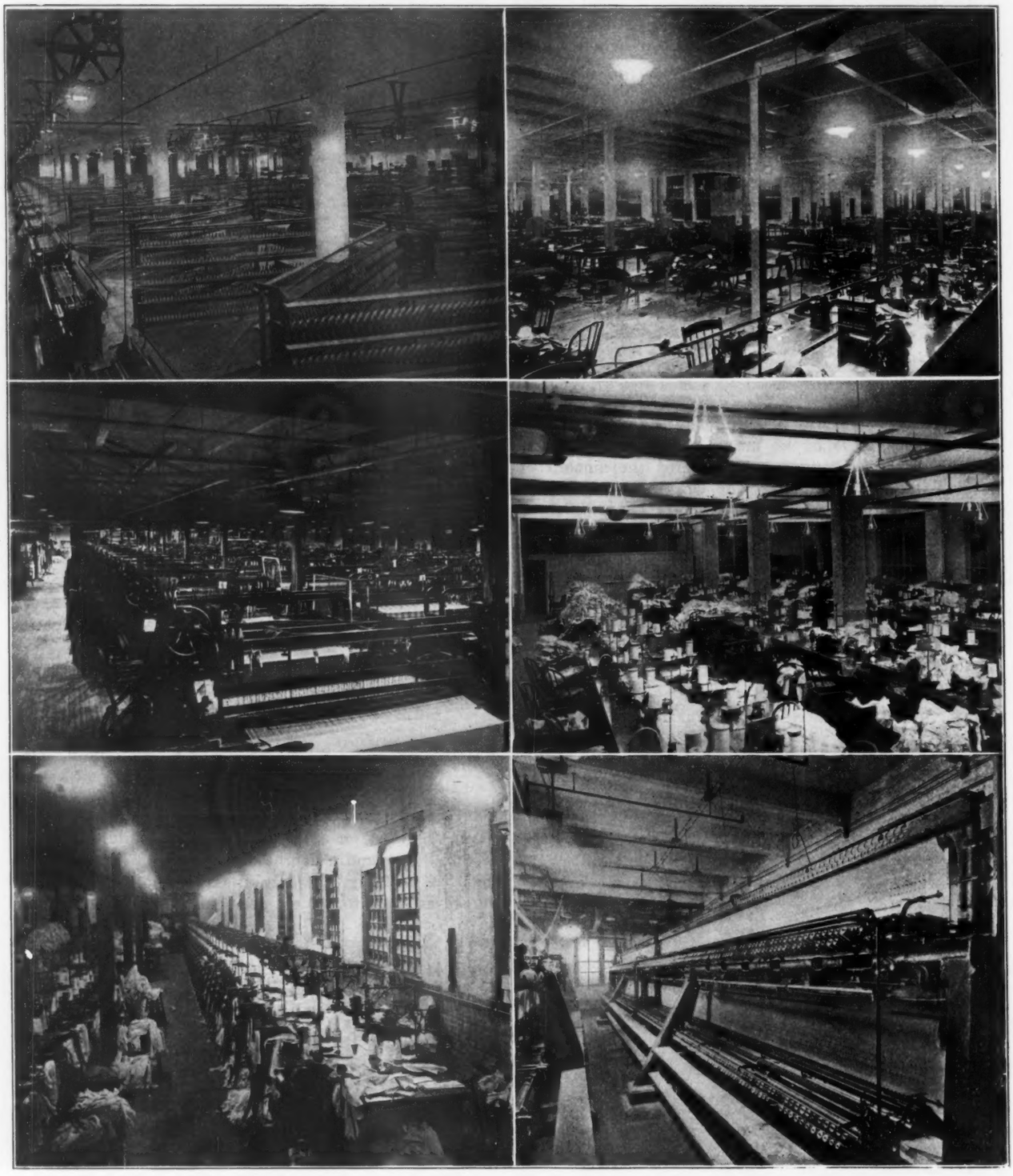
Two facts stand out as among those requiring greatest attention in this industry. One is that of inadequate intensities, and the other is that of annoying and harmful glare from bare and insufficiently protected light sources. The prevalence of glare in women's garment factories has been referred to already. The most apparent cause is the use of bare lamps without any shielding reflector, and hence the simple program

[2]Figs. 1, 2 and 10 are based on Public Health Bulletin No. 71 (May, 1915), by J. W. Schereschewsky and D. H. Tuck. Washington, D. C.: Government Printing Office.

[3]This curve is based on an article by L. B. Marks in the Johns Hopkins University lectures on illumination, page 665.

of effecting a more consistent use of reflectors may well be looked upon as important work for the immediate future.

One scheme which has been suggested for specifying the angle of glare is represented by Fig. 10. From this diagram it may be seen that when the line of vision is not raised above the far (right) edge of the table, the angle of glare is then a minimum, that is, θ_1,



FIGS. 4, 5, 6, 7, 8 AND 9—EXAMPLES OF VARIOUS TYPES OF ILLUMINATION IN TEXTILE AND CLOTHING PLANTS

(A, B, top; C, D, middle; E, F, bottom)
A—Warping department of the Botany Worsted Mills, Passaic, N. J., where 400-watt gas-filled tungsten lamps, equipped with dome-shaped enameled steel reflectors, are mounted 14 ft. above the floor and about 26 ft. apart. The illumination intensity is 4.5 ft.-candles and the power demand 0.6 watt per square foot. B—Coat department of Rosenburg Brothers & Company's clothing plant, New York, in which 400-watt and 500-watt gas-filled tungsten lamps equipped with reflectors and inclosing globes are mounted 14 ft. above the floor. The intensity is about 4.5 ft.-candles and the power demand 0.7 watt per square foot. C—Weave room of Seymour Woolen Mills, Seymour, Ind., equipped with 60-watt vacuum-type tungsten lamps, fitted with rippled-glass reflectors, 7 ft. apart and 8 ft. above the floor. In the aisles the lamps are 9 ft. 6 in. above the floor. D—Sewing-machine department of Wise Brothers Company, Baltimore, Md., where indirect fixtures fitted with 300-watt gas-filled tungsten lamps and rippled-glass reflectors are employed. The ceiling height is 12 ft. 6 in., and the distance from the top of the bowl to the ceiling is 36 in. Each outlet is controlled by a separate ceiling ratchet switch. The power demand is 1.68 watts per square foot. E—Portion of Racine Feet Knitting Company, Beloit, Wis., illuminated by mercury-vapor lamps. F—Section of the Newark (N. J.) Embroidery Works lighted by mercury-vapor fixtures.

and when the eye is directed at the near (left) edge, it is a maximum, namely, θ_2. If θ_1 is greater than one-half of the visual angle, and the line of vision is toward the right edge of the table, no glare will result. Obviously, under such circumstances, glare will not result if the line of vision is toward the left edge of the table. For low mounting heights it is practically impossible to realize this condition unless the lamps are adequately protected by suitable reflectors. It should be noted that the difference between the intrinsic brilliancy of the objects viewed and that of the lamp filament or other cause for glare is also a decided factor in the effect that glare will have. In other words, the element of contrast has a considerable bearing on the glare problem. It is therefore evident that to avoid or to reduce glare the lamps should be well overhead and should be adequately inclosed by reflectors.

Some attention has been given by engineers to the

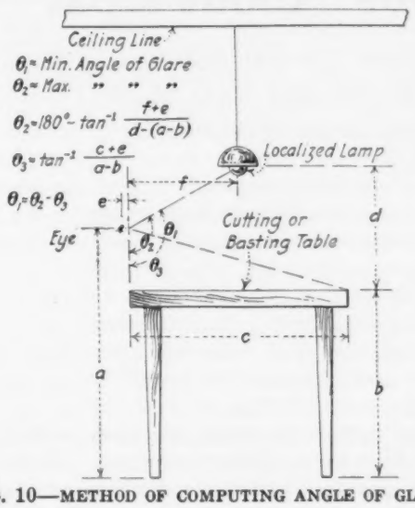


FIG. 10—METHOD OF COMPUTING ANGLE OF GLARE

variations in the requirements of illumination for dress goods of different colors and shades. The findings of the British factory lighting report (page 36) point to the following conclusions, which are based on the experimental results given in Table III:

(1) That the illumination needed to make work possible on a very dark material may be ten times that required with very light material.

(2) That, on the other hand, the requisite surface brightness is constant within the limits of experimental error.

(3) That the average surface brightness needed to make threads of calico of different tints visible to one normal eye (WCDW) may be represented by 0.73, and to another normal eye (BPD) by 0.60.

Table IV gives the values of the coefficient of reflection (sometimes termed the "albedo") of materials commonly worked upon in the workshops of the women's garment industry in New York City.

Data published in the British report (page 34) show that when the illumination was increased gradually from low to higher values the intensity required for dark goods averaged about 5½ ft.-candles, while for very light goods it was about 1¼ ft.-candles. These results are based on actual observations where sewing work was being performed. The following comment, found in the above report, is interesting because it gives an opinion on the comparison between direct and indirect lighting for sewing work:

"It was readily apparent that for equal ease in distinguishing detail a considerably greater illumination was required [with indirect lighting] than in the case of direct light. This is only to be expected, having regard to the fact that the shadows shown by indirect light are always far less intense than those given by direct light, and that the variation of illumination over a curved surface is also much less with diffused light. The superiority of direct light for sewing was insisted on by the seamstresses who worked in the experimental room under different illumination conditions."[4]

The conclusions of the extended investigations as given on page 37 of the British report upon this industry are quoted herewith because they summarize the results in a concise and useful manner. It is to be remembered, however, that these conclusions are merely presented as those of a given committee which has presented these facts more or less as a preliminary report to further and more detailed investigation:

(1) The illumination required for the perception of detail in materials having a low coefficient of reflection is greater than for those which reflect more strongly, and, other things being equal, is inversely proportional to such coefficient of reflection; that is to say, for equal visibility there must be constant surface brightness.

(2) The visibility of detail in self-toned portions of fabrics, embossed paper and similar substances, depends on the unidirectional character of the light illuminating them. It follows and has been shown experimentally that the ability to distinguish detail in such substances is for the same illumination much greater by direct than by indirect light.

(3) Work such as sewing may be comfortably performed on the darkest materials with an illumination of 5 to 6 ft.-candles (direct lighting). For white calico 1¼ ft.-candles was found sufficient, and intermediate shades were found to lie between these values.

(4) The observations on the phenomena of glare have not as yet yielded definite numerical results. They have shown, however, that the presence of a bright lateral light, although causing a feeling of annoyance, does not actually diminish ability to distinguish detail unless the surface brightness of the object viewed is relatively low.

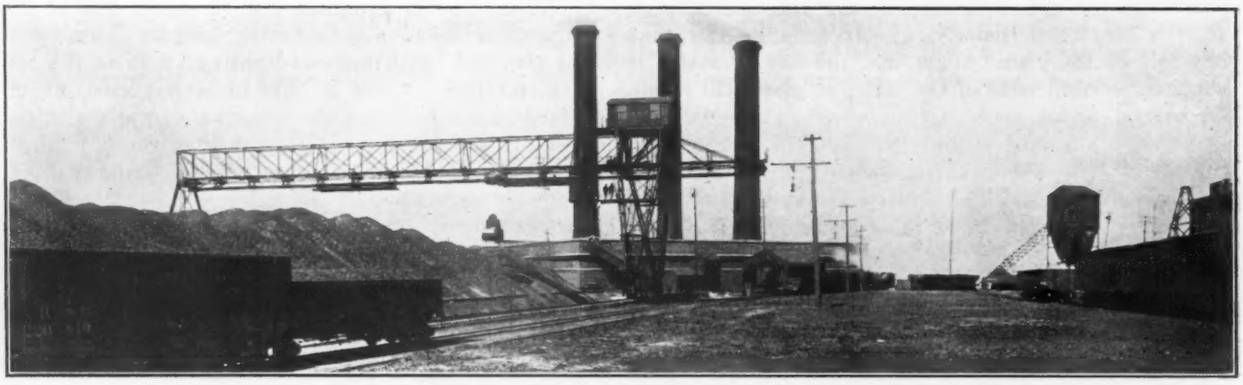
The Schereschewsky-Tuck report, referred to in the first part of this article, recommends a minimum of 5 ft.-candles for work in the women's garment industry.

ACTUAL CASES ILLUSTRATED

Figs. 4 and 5 give a good idea of the illumination results obtained in worsted mills with large tungsten lamps and steel dome-shaped enameled reflectors. Fig. 6 shows a coat department where 400-watt and 500-watt tungsten lamps are housed in Benjamin inclosing globe-type reflectors. Fig. 7, in contrast with the foregoing, is a good example of illumination with small lamps (60-watt tungsten), this being an excellent illustration of the use of X-ray reflectors where the lamps are mounted comparatively near the machines in a woolen mill.

The above examples all relate to direct lighting with Mazda lamps. Fig. 8, on the other hand, shows the use of indirect lighting where 300-watt tungsten lamps are mounted in X-ray 1321-M indirect fixtures. Fig. 9 is an example of mercury-vapor lighting. Special attention is directed to the technical data included in the captions of most of the illustrations. These data are useful in showing the standards which apply to this class of illumination at the present time in typical mills.

[4]It may be noted that in this country indirect lighting is beginning to be used quite extensively in textile-mill work.



A LARGE COAL SUPPLY IS INSURANCE AGAINST THE WINTER'S PROBLEMS

Central West Is Anxious About Coal

Alex Dow, President Detroit Edison Company, Advises Central Stations to Learn How Much Contract Coal They Will Get Next Winter and How Much They Will Need from Open Market—Apprehension Elsewhere

A SECTION of the Central West which was a heavy sufferer from coal conditions last winter is watching the progress of time toward the winter of 1917-18 with much apprehension. Central station operators in this district are asking whether they will have to bear as much anxiety regarding their coal supply and cost as they did last year. They are asking these questions of coal mine owners, of railroad officials, of their national association representatives.

A representative of the ELECTRICAL WORLD investigated conditions in a number of communities, and his report is published in part herewith. So far as interference from weather is concerned, railroad operating conditions have now the maximum advantage of the year. Undoubtedly the railroads are meeting the situation at present better than they did last winter. They have yet to face, however, the fall crop movement, and it is to be remembered that they are struggling daily with the greatest traffic movement in history, already a prolonged one but promising to be still heavier. Coal-mining companies are confronted by overwhelming demand and a potential runaway price situation.

It is between these two millstones that the central station is in great danger of being ground. So that the prudent operators are looking about to see what steps they can take to safeguard their supply and, if possible, prevent curtailment of service. For if they are unable to get their usual supplies of coal it will be necessary to restrict service to certain classes of consumers.

That, however, is not a contingency which the central station executive accepts except as a last resort. More attention is being given than ever before to the problem of fuel supply and cost. There will be developments in central station policy which will affect the companies permanently. These are based on growing realization of the fact that the coal situation will be altered for several years if not for all time.

MR. DOW ON DETROIT CONDITIONS

At present the coal situation in Detroit is a little better. Alex Dow, president and general manager of the Detroit Edison Company, said:

"The situation is better as to both supply and price than it was last winter or even in May. We are doing our utmost to prevent repetition of the conditions of last winter.

"Coal production is hampered by the same influences which hold back every other industry; that is to say shortage of labor and materials. The machinery most needed in mining cannot be bought for delivery in less than seven or eight months. If the government exempts the workers in coal mines from military service, that will tend to maintain production. Unquestionably both the operators and the committee on coal production of the Advisory Commission of the Council of National Defense will do all that they can to increase the output.

PROMPTER CAR MOVEMENT

"The next question is that of transportation, and that is more serious. If the dangers of last winter are to be avoided, it will be necessary to have more prompt movement of cars. What is needed is not more cars, but more locomotives to move cars, more trackage and more men to man the locomotives and switches. In order to move a given amount of coal to us last winter twice the number of cars were required en route from mine to destination that would have been used under normal conditions. More locomotives, more trackage, more men would have overcome the necessity of using so many cars and the surplus cars would have been released for service elsewhere. I believe that the problem of transportation of coal will be lessened during the coming winter by various arrangements which will accelerate car movements. The railroads are certainly working with one another in a fashion heretofore unknown—and heretofore even illegal; and that there will be much slack taken up, and less duplication of work and less fuss, is already very certain.

"As to price—it is lower at the moment. I think that it will be lower during the next winter than it was last winter. The action of the coal production committee in co-operation with the coal producers has undoubtedly had an effect in making prices easier. The

speculator who did so much to boost prices last winter will be eliminated. There may be evasions on one excuse or another of the maximum price of $3 per ton agreed upon by the coal production committee; already there is one in an attempt to add the 25 cents per ton selling cost where there is no selling expense. All indications, however, go to show that average prices will not reach the abnormal level of last winter, although they will be substantially above the old normal figures and likely to continue so for two years or longer.

"It behooves every central station company first to find out how much coal it can depend upon getting from producers with whom it has contracts; second, to consider very seriously what part it can chance buying in the open market."

Mr. Dow is of the opinion that the experiences which public utilities have undergone will lead them to a more general adoption of the policy of owning interests in coal mines as a protection against the future.

Miss Sarah M. Sheridan, sales manager of the company, said that the volume of new business continues to be substantially above the level of last year. Notwithstanding the heavy demand from power consumers and the difficulties of coal supply, the company is meeting all demands for power and from all classes of consumers in the settled districts. It is not soliciting new business as aggressively as heretofore and, on account of the dearth of materials and the high cost, has had to restrict extension into new districts and rural lines.

General retail rates are covered by informal agreements with municipalities which have one year to run, and the only rates that could be adjusted were the wholesale rates for primary energy. Practically all of that business is done on three-year contracts, and an increase of approximately 10 per cent is effective on renewals of these as they elapse and of course on new business. It has not been considered desirable thus far to use a coal-cost rider because the offer of a stabilized rate for a definite term is part of the established selling policy.

GET SIX MONTHS' SUPPLY, SAYS F. R. COATES

Frank R. Coates, president Toledo Railways & Light Company, advises every utility company to try to get six months' coal supply in storage before winter.

One of the great obstacles with which this company is contending is that coal-mining companies claim they cannot hold labor because of lack of cars. Coal operators with whom the company has contracts state that they are unable to get empty cars for loading coal and therefore cannot keep miners at work continuously. Under these conditions the miners find other work and the contracts for coal supply are not kept.

The situation at this time is somewhat better than it has been, but the company faces the winter with much apprehension.

As the growth of demand shows no sign of stopping, the company is rushing construction on its large new generating plant. By overtime work, it is figured, the station will be completed on Dec. 1. The equipment will be ready before that date.

A. K. Young, new-business manager of the company, said that the organization of his department is being maintained at its full quota. Active solicitation is being continued in every direction, and in both energy contracts and merchandise sales excellent results are obtained. Mr. Young says that no indication of reaction in business is apparent and that any decrease arising from the war will be overcome by increases due to greater activities in other directions on account of the war.

CLEVELAND MUNICIPAL PLANT LOADED TO CAPACITY

In the public office of the division of light and heat of the city of Cleveland the following notice appears:

Until the new extensions of the power plant are completed:

1. No applications for electric power can be considered.
2. Applications for electric light may be made, but service will be installed only as replacements occur in territory where no other service is available.

Commissioner William E. Davis said that unless the coal situation is controlled it will cause the ruin of many public utilities. He spoke of a hearing in Washington before a committee of the United States Senate appointed to consider coal conditions which he attended recently. At this hearing a telegram from a Canadian consumer to an American coal company was exhibited. It ordered 50,000 tons, "price no consideration."

"People are bidding against each other in a senseless way," said Mr. Davis. "If, for instance, a manufacturer gets a contract for the construction of aeroplanes and has a large profit in prospect, he does not care what he pays for coal. He orders as did the Canadian consumer whose telegram I saw, without regard to price. The coal dealer cuts off his contract customers to provide for the man whose profits are so high he does not care what he pays. This condition mitigates decidedly against public utilities whose selling prices are fixed by contract or franchise."

Mr. Davis thinks that utilities have great difficulties to overcome in getting adequate coal supplies at reasonable figures for the next winter. He said that coal producers did not deny that $1.50 physical cost plus 25 cents per ton would yield them a good profit, but it is impossible to buy at that price.

SITUATION IN INDIANAPOLIS

Charles C. Perry, president Indianapolis Light & Heat Company, said:

"The present necessity is that the companies shall be able to meet the extraordinary demands upon them for energy. These demands are made greater by war.

"Unless the companies can overcome their heavily increased costs of operation by corresponding increases in rates they will be greatly hampered.

"In addition to meeting higher operating expenses, the companies have the heavy obligation of providing facilities for the increasing power requirements of the future. We are working hard to complete our new plant in order to be ready with greater capacity for the coming winter. It is costing us twice as much as it would have done under former normal prices. This means that not only do we have to find a market for double the securities, but that our lasting interest charge is that much more in proportion.

"We, however, are presenting the facts about increases in costs of all materials as well as labor in asking the commission for authority to make the temporary surcharge of 30 per cent while conditions remain abnormal.

"The coal situation is more serious than is generally realized."

Selling Appliances to Employees

An Investigation into Current Practice and Policy Tending to Show that the Method of Charging Cost Plus Overhead and Handling Finds Greatest Support

MORE than once in recent months the suggestion has been made that central stations would find it advisable to give electric appliances to employees gratis, especially to salespeople. The argument that is always advanced when this suggestion is made is that if they are familiar with the practical operation of the appliances sold salespeople will sell more appliances and sell them better. They will be able truthfully to point out the merits of each appliance. They will have a deeper and far more intimate knowledge of electrical appliances from experience gained by using them in the actual routine work of the home. Other employees, too, through the every-day use of electrical appliances in their homes are better able and more apt to recommend the use of appliances to their friends and neighbors.

The main object of these suggestions, of course, was not to get free appliances for employees, but rather to increase the knowledge of employees, especially salespeople, in the ways of electrical operation.

An investigation of the policy of central stations in different parts of the country on this subject has been made by the ELECTRICAL WORLD. Throughout the entire investigation, however, no case was found where appliances are given gratis. In fact, in most cases the executives were very much opposed to giving appliances away to employees not from the standpoint of cost but from that of results. It was repeatedly pointed out that what is obtained for nothing is held cheaply. It is a fact that the average human being is so constituted psychologically that he takes most pride in that for which the most was paid.

On the other hand, there was very little evidence of the companies making any profit out of the employee's purchase of appliances. In fact, an analysis of the policy of twenty-two representative electric lighting companies showed only one company that charged the full retail price to employees. No reason for this was given by the company in question, but later when asked why employees received a consideration in regard to lighting sales it stated that there was no reason, and in fact that it was a bad practice.

Cost Plus Basis Most Popular

Of the remaining twenty-one, three had special appliance rates for employees, one 20 per cent off, another 33 1/3 per cent off and the third merely a special rate. Seven companies made a practice of selling all appliances to all employees at the invoice cost to the company, while the remaining eleven had established a cost plus basis. This cost plus basis, which seemed to be the most popular, provided that the employee should pay the entire cost to the company. In other words, in addition to the invoice cost there was another cost for storing, handling and other overhead. This extra cost as a rule is made a flat 10 per cent of the invoice cost. Others add 15 per cent, while some add the exact cost of these items instead of a flat percentage.

In one instance where appliances are sold at invoice cost they have to be for the employee's own use. When they are purchased by the employee for gifts the company exacts an additional 10 per cent for overhead and handling.

It is interesting as a sidelight that while most of the companies not only gave employees lower retail prices, but also allowed from ten to twelve months or longer as occasion demanded in which to pay for the appliance, there were one or two that sold to employees at reduced prices only for cash.

Pacific Coast Practice on Ranges

On the Pacific Coast a situation with regard to range sales was revealed which was not found in any other section of the country. A number of companies that charge invoice cost plus overhead and handling on socket appliances charge only invoice cost on electric ranges. One company reported that it also installs free all ranges purchased by employees. This item of inside wiring is by no means a negligible amount. The company using this plan reports that approximately twelve employees have thus far purchased electric ranges.

One of the Pacific Coast companies selling ranges at cost reports that this practice, which has been in effect a little over a year, has so far resulted in the placing of about thirty ranges in the homes of employees.

Some companies make it a practice to merchandise second-hand appliances that have been received—those that have been exchanged for something else or returned appliances—to employees. One company leaves the sale of such appliances to district managers. Employees receive regular sales letters telling what equipment is available and the terms on which it is sold. Another company places this equipment before employees at certain definite intervals. In the latter case it has been found that employees are very glad to have the opportunity to obtain these appliances. In this case most of the appliances offered are shopworn or slightly damaged through handling. These are offered to employees at a very considerable saving in price.

This distinction in the matter of appliance prices to employees has been found to give the desired results. In practically every place where such a plan has been tried out a large number of appliances have been sold to employees and a great many employees once they have purchased appliances have become enthusiastic boosters.

It is generally believed that employees should be encouraged to purchase and use appliances, and in a large number of cases they are actually urged to buy. One company reported that thousands of dollars' worth of appliances have been sold to employees, and it is known that they are in general use.

In making this investigation it was thought to be advisable to disclose current practice regarding the policy of charging employees for energy, it being felt that there might be some connection between the two prac-

tices. In some cases this is certainly so, for the employee has been encouraged in every way to use appliances.

Most companies give some reduction in energy rates from regular charges. These run all the way from a flat discount of 50 per cent to special rates of 5 cents per kilowatt-hour. Some of the others make no charge for the first block and the same rate as to other customers or reduced rates for all further consumption. One company makes no charge for the first 10 kw.-hr.; this is the greatest concession. Another company makes a flat charge of 25 cents for the first 30 kw.-hr., and charges 3 cents per kilowatt-hour for all in excess of 30 kw.-hr.

Quite a number of the companies investigated make no distinction in rates in favor of employees. In most of these cases, however, the State Public Service Commission has expressly forbidden any such discrimination in favor of employees.

An effort was made to find out what it costs a utility to follow a plan of reduced prices and rates to employees. Since the practice, however, is generally to sell to employees at the cost of the company, including handling and overhead, the cost of such policy is very small or nothing. On the matter of rates it is probably true that the utility neither makes nor loses money. From the financial standpoint the utilities stand neither to lose nor to make money from commercial dealings with employees, or at any rate a very insignificant amount either way.

VALUE OF REDUCED-PRICE PLAN TO UTILITY

That the plan, however, is of profit or advantage in other less tangible ways is very evident. Favorable advertising and publicity, enthusiastic boosting, knowledge of appliances, employees' good will, etc., are some of the advantages cited. The following paragraphs are quoted in this connection from different commercial managers:

"The small cost to the company of thus encouraging employees to use electric service is believed to be recompensed many times by the advertising which the company gets."

"We note that the employees who do 'cook by wire' are able to speak with assured confidence, and a statement direct from them to the future 'prospect' in regard to their own range carries with it a great deal of weight."

"I believe our policy has been beneficial in assisting the advertising of appliances to the general public and in bringing us certain data. Such a practice is likewise, I think, good policy on the part of a central station in promoting good will among our employees."

"We have obtained considerable information relative to the advantages or disadvantages of certain appliances and information relative to the cost of using the same."

"The reason for this [reduced prices to employees] is that it is necessary for employees to be familiar with energy-consuming devices, and the best way to become familiar with them is to use them in their own homes."

"This method [cost price] has been of advantage to the employees in obtaining electrical appliances below market prices and to the company because of the energy used. The educational advantages have been tremendous, and it is impossible for us to put a valuation on them. We are firmly of the opinion that central stations should make it easy for employees to obtain electrical appliances for personal use."

SUMMARIZING

1. It is a more frequent practice to sell appliances to employees at invoice cost plus an amount sufficient to take care of overhead and handling.
2. Most companies make a distinction in favor of employees in regard to lighting rates.
3. These plans have been found to work out very advantageously to utilities in such intangible ways as advertising, education and good will.

TESTS ESTABLISH DATA FOR LARGE MINE HOIST

Inertia of Flywheel on Motor-Generator Set Used Sufficient to Hoist Load 1500 Ft. with Energy Supply Uninterrupted

The results of a series of tests under operating conditions recently made on an Ilgner-Ward-Leonard hoist installation in the mines of the Elm Orlu Mining Company at Butte, Mont., were given in a paper by R. S. Sage submitted at the recent "war" convention of the American Institute of Electrical Engineers in New York City.

This is one of the two largest installations of this type in this country. As the energy charge is based on the maximum instantaneous demand, the flywheel inertia was made sufficiently large to completely equalize the maximum duty cycle met in balanced hoisting from the deepest level.

The hoist-motor speed and direction of rotation are controlled by varying the strength and reversing the polarity of the generator field. Between the motor and generator there is inserted an overload circuit breaker and a single pole-line switch. The arrangement of the control levers is extremely simple, there being but one power lever, a forward movement corresponding to one direction of rotation, and a backward movement, the reverse.

A Welch safety device compels slowing down at the proper rate and provides protection against overwinding and overspeeding. As an additional protection, limit switches actuated by the skips themselves are installed in the guides. These switches, as well as the Welch device, cause the direct-current circuit breaker to open, in addition to setting the hoist brakes. In general, any emergency which will cause the direct-current circuit breaker to open will cause the brakes to be applied.

The total energy in the flywheel at 94 per cent synchronous speed is 117,000 hp.-seconds, of which approximately 50 per cent is available for operating the hoist in event of the set being disconnected from the power supply, the limitation being the speed at which the direct-current exciter is no longer able to hold up its voltage. If required, a complete trip with a fully loaded skip could be made from a depth of 1500 ft. (457.2 m.) on the energy of the flywheel, and a load of men could be hoisted from the deepest level.

Hoisting "out of balance" can be carried on without causing excessive speed reduction of the set or necessitating a higher limit of demand from the power supply.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

SCHEME FOR INSPECTING TRANSFORMER INTERIORS

Telescoping Tube with Lamp Mounted at Lower End, Which Is Sealed with a Glass Disk, Is Used to Inspect Windings and Connections

Often it becomes necessary to inspect the windings or interior connections of oil-immersed transformers. To overcome the difficulties of using a lamp and trying to see through the oil, one Southern central-station company is employing a telescoping tube the lower end of which is sealed with a glass disk to prevent oil filling the tube and obstructing vision. A lamp is attached to the outside of the tube near the lower end so that the glare of the filament will not reach the user's eye. When the proper voltage is not available for operating an incandescent lamp, a flashlamp may be attached to the tube. The tube is made of five sections, each about 2 ft. (61 cm.) long. This device enables the men to inspect the interiors of oil-immersed transformers without getting into the oil as is sometimes necessary.

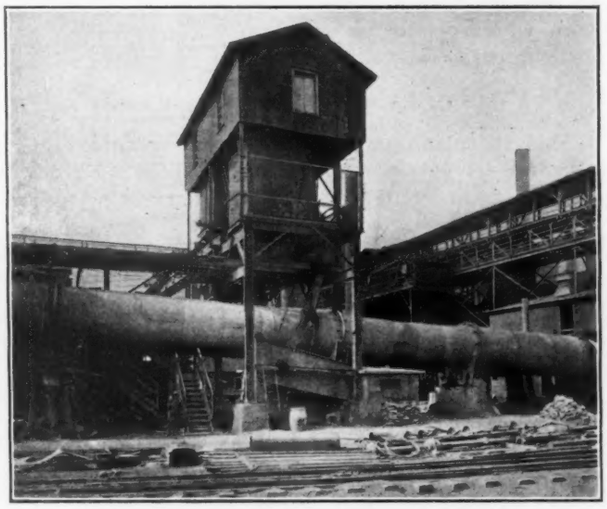
ELECTRICAL OPERATION FOR A CEMENT KILN

Reasons Given for Using Motor-Drive, Type of Motor Selected and Method of Control Employed

Since motor drive permits the most satisfactory kind of speed control and offers other advantages, such as simplicity and flexibility of arrangement, reliability, etc., it is especially desirable for rotary cement kilns. In the accompanying illustration is shown a view of a highly successful motor application of this kind. The kiln is 110 ft. (33.5 m.) long and 8 ft. (2.4 m.) in diameter. Ground rock is fed into the upper end of the kiln, which slowly revolves and works the charge downward. At the lower end powdered coal is blown into the kiln, where it burns almost instantly, producing the necessary high temperature for converting the mixture of limestone and shale into cement.

In burning cement the rock must be subjected to exactly the right temperature. If the temperature is too low the necessary chemical reactions will not take place, and if the temperature is too high an inferior product is obtained. The proper temperature can be obtained only when an exact relation exists between the quantity of rock supplied, the speed of its travel through the hot zone and the amount of fuel used. Constant attention is necessary to maintain this relation. Whenever the cement begins to burn improperly the kiln attendant can alter any one or all three of these variables, but it is obvious that the simplest and most satisfactory thing to do is to leave the rock and fuel feeds constant and correct irregularities by altering the speed of the travel of the cement by changing the speed of the rotation of the kiln.

The latter method is employed at this plant. The motor driving the kiln is a 30-hp. Westinghouse slip-ring alternating-current 720-r.p.m. machine. It is mounted in an inclosed compartment under the kiln and is bolted to a gear that meshes with another gear mounted circumferentially on the kiln, the reduction being such that the speed of the kiln is about 1 r.p.m. An alternating-current motor is used because it can withstand the dust better than a direct-current motor. Dust-proof bearings are essential in this service, and the motor must not be dependent on small ducts for its ventilation, as these are liable to fill up and cause the motor to burn out. A slip-ring-type motor is used in order to provide speed control. Since a speed reduction of 50 per cent is sufficient and the torque is constant at all speeds, the slip-ring motor's characteristics fit the drive suitably. This type of motor is also necessary to supply sufficient torque to start the huge mass of the kiln revolving.



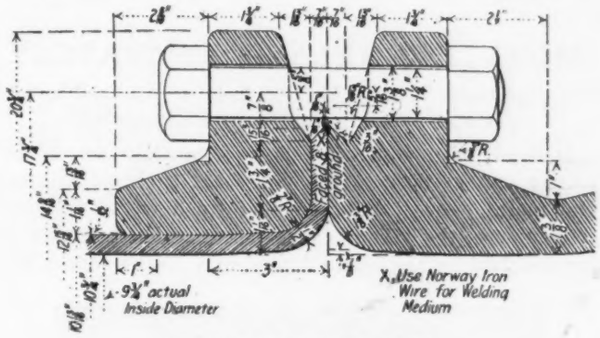
MOTOR IS MOUNTED IN INCLOSED COMPARTMENT UNDER THE KILN

The kiln operator is stationed at the rear end of the kiln, where he is protected from the intense heat by a brick shield. He watches the burning of the cement through an aperture in the shield (using dark glasses to protect his eyes). From time to time he adjusts the kiln's speed of rotation by means of a conveniently located controller. Above this controller is an ammeter. Since the current taken by the motor will vary between definite limits under normal operation, erratic meter readings indicate trouble somewhere. Warning being thus given, repairs can frequently be made before the trouble has become serious enough to make necessary the shutting down of the kiln.

JOINTING PIPES FOR HIGH-PRESSURE STEAM

Abutting Flanges Faced and Welded Together Around the Adjoining Edges to Prevent Leakage —Bolts Clamp Flanges Together

Shown herewith is the type of the joint being used in the high-pressure piping at the Northwest station of the Commonwealth Edison Company. The sections to



DETAILS OF WELDED JOINT

be joined are faced and clamped together by rings drawn up by bolts. The peripheries of the adjoining sections, which are beveled to form a sort of ridge, are welded together to seal the joint and prevent leakage. Norway iron is used as a welding medium.

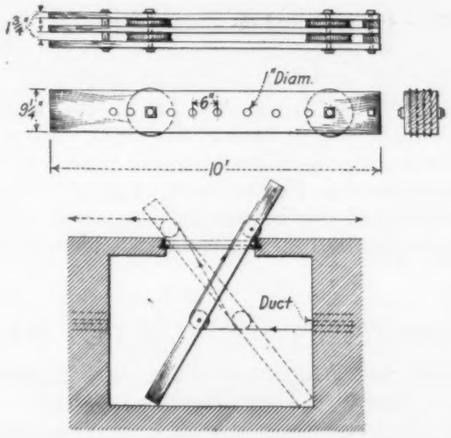
SHEAVE RACK BUILT FOR CABLE PULLING

Method of Constructing and Using Outfit for Pulling Cable and Its Advantages Over Snatch-Block Method

BY N. NESBITT TEAGUE

Augusta-Aiken Railway & Electric Corporation

To facilitate pulling underground cable the Augusta-Aiken Railway & Electric Corporation makes use of sheave racks like the one shown herewith, which is composed of three boards, three bolts and four pulleys



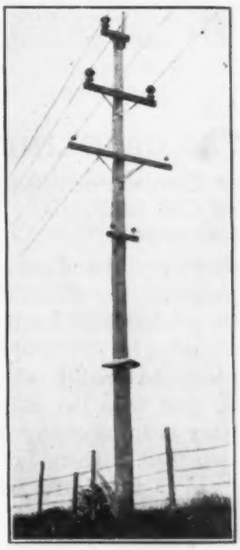
DESIGN OF CABLE-PULLING SHEAVE RACK

from 10-in. (25.4-cm.) blocks. To use the rack it is placed in the manhole so the end will bear against some substantial surface. Then the pulleys are adjusted so that one will be opposite the duct in which the cable is to be pulled and so the other will be above ground. One end of the rack is made so that it will fit over cables which are continuous or already installed so slack may be pulled in. One advantage of this device over ordinary snatch-blocks is that the pulleys may be placed opposite the ducts in which the cables are to be pulled. For pulling out cables it has been found that this device will not cut or damage the cable in any way. One or two cables may be pulled at once. In case conditions on the street level prevent pulling with the line and rack in the position indicated, the rack may be shifted to the position shown by the dotted line. This device was made under the direction of J. J. Borger, general superintendent of the electrical department.

GUARDING TRANSMISSION LINES FROM SQUIRRELS

Method That Prevents Small Animals from Short-Circuiting Electric Lines in the Zinc Fields of Northern Illinois

Throughout the Middle West transmission-line trouble is occasionally caused by squirrels which climb poles and in doing so ground or short-circuit the lines. When metal cross-arms are used and the arms are connected to a ground, trouble arises if a squirrel attempts to jump from the cross-arm to the top of the insulator. With wooden arms the trouble comes from the fact that the squirrel's tail usually touches the grounded bayonet as he jumps from the cross-arm to the top of the insulator.



POLE EQUIPPED WITH GUARD

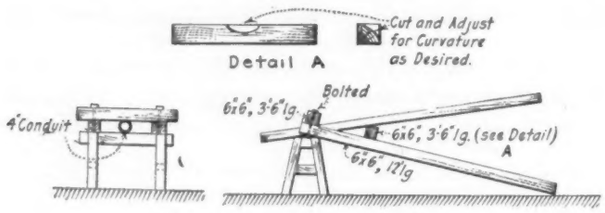
These troubles are being remedied by one company in northern Illinois by insulating the sky wire from the bayonet and taking the ground wire down the pole in such a manner that it does not make contact with the metal cross-arms or the bayonet. This is accomplished by connecting the ground wire to the sky wire several feet from the pole and then running the ground wire downward at an angle toward the pole so that it can be attached to the pole several feet below the metal cross-arm.

When the Interstate Light & Power Company of Galena, Ill., experienced squirrel trouble on a line which serves large power customers in the neighboring zinc fields it was unable to employ this method because the service could not be interrupted long enough to do the work on the poles. It was therefore decided to keep the squirrels from climbing the poles by annular disks of galvanized iron placed around each pole about 8 ft. (2.4 m.) above the ground. About 1000 poles between Galena, Ill., and Plattsville, Wis., have been equipped in this manner and results have been entirely satisfactory. The squirrels, nimble as they are, have been unable to pass the disk, and their pernicious activity has been checked.

OUTFIT FOR BENDING CONDUIT

Operation Performed by Inserting Conduit Between Cross Timbers and Bearing Down

Elaborate apparatus does not have to be employed for bending conduit if an outfit like the one illustrated herewith is constructed. The principal part of the outfit consists of two 6-in. by 6-in. (15.2-cm. by 15.2-cm.)



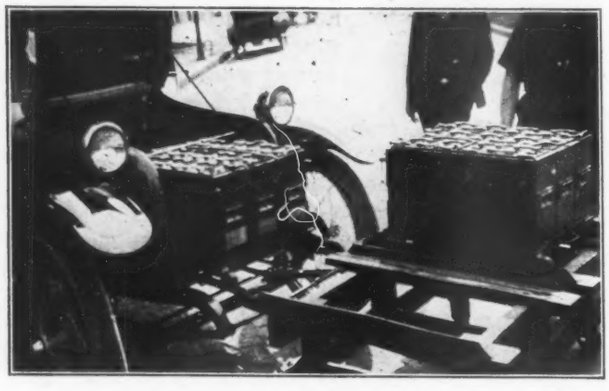
DETAILS OF CONDUIT BENDER

timbers 12 ft. (3.6 m.) long with a 3½-ft. (1.14-m.) timber of similar size bolted across the end as shown. This end of the frame is laid on a sawhorse or pile of bricks or stone, one end of the conduit to be bent being placed beneath the cross timber, and another cross timber, modified as shown in detail A, placed across the frame beneath the portion of the conduit which is to be bent. Downward pressure may then be applied to the free end of the conduit, causing it to bend over the unfixed cross timber.

MAKING BATTERIES AS AVAILABLE AS GASOLINE

How Details of Storage-Battery Compartment and Garage Truck Were Worked Out to Facilitate Quick Battery Change

In connection with a storage-battery rental and service plant for electric passenger vehicles, the Fashion Garage of Chicago has worked out a scheme to facilitate battery changing. Charged batteries in trays fitted with castors are kept in readiness on small trucks the top platforms of which are equipped with two sets of angle-iron tracks. When a battery is to be changed the battery-box leads are first detached. Then two angle-iron uprights which are hinged to the frame of



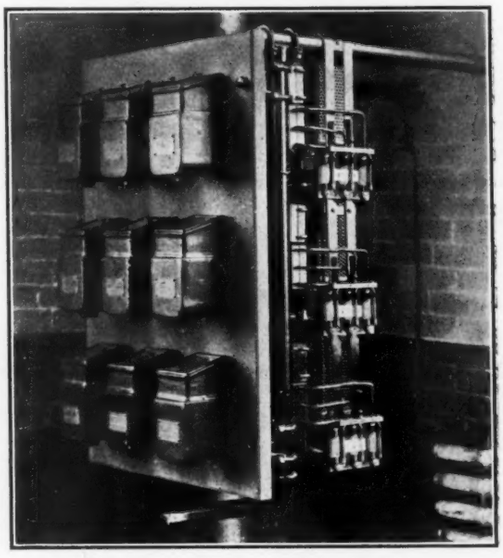
BATTERIES BEING EXCHANGED

the car and which hold the battery in the car are released and swung down into a horizontal position where they form a link between the track in the battery compartment and the track on the garage truck. The battery in its tray may then be rolled out on the platform of the truck. With this done the truck is moved over so that the charged battery is in line with the battery compartment and the fresh battery is rolled into the car. It is secured by means of the hinged track sections and the leads are connected. By the use of this plan batteries are changed in the light Milburn passenger cars in about two and one-half minutes, so that getting a new charge is accomplished as quickly as filling a tank with gasoline.

MOUNTING RELAYS SEPARATELY

Arrangement Which Makes Relays Accessible and Reduces Wiring on Main Switchboard

Instead of mounting relays separately on feeder panels and so close to the floor that their adjustment and maintenance cannot be performed with maximum convenience, the arrangement shown in the accompanying illustration has been adopted in a Maine substation.



RELAYS MOUNTED SO THEY MAY BE ADJUSTED AND MAINTAINED WITH CONVENIENCE

The relays are mounted on a single panel in a corner of the substation operating room and connected with their respective oil switches by leads carried in conduit. Space is provided at the rear for resistor units. The relay switches can be seen at the right. Inspection of relays is accomplished in minimum time with the arrangement shown. Furthermore, it provides maximum accessibility and also reduces the amount of wiring and equipment required on the main switchboard panels.

ENAMELED TAGS FOR POT-HEADS

Stenciling and Aluminum Tags Are Objectionable Because They Become Illegible

A Middle West company with a rather extensive underground system is changing its method of designating pot-heads in manholes. Enameled-letter tags are now being used to mark the pot-heads instead of stenciling or using aluminum tags. Stenciling is objectionable because the letters become covered with dirt and cannot be found. Aluminum tags are affected by gas and moisture so that they become illegible.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

VERY LITTLE EVIDENCE OF COMMERCIAL CURTAILMENT

Most Companies Trying to Increase Departments' Activities to Sell Household Devices, for Which There Is an Economic Demand

Since early spring there have been reports from here and there that central station companies were materially reducing their commercial departments. To find out to what extent this has developed the ELECTRICAL WORLD has carried out an investigation of actual conditions.

Very few companies, it was found, have taken any such step. No single reason can be given for those that have. One property found the present to be an excellent time for removing a lot of deadwood in its commercial organization; another found the station capacity all sold and decided to dispense with salesmen until further equipment could be secured. Two companies found it to be necessary that they economize in every way possible and picked out the commercial department as the place to start.

In a number of cases, of course, there have been reductions, but these have almost all been occasioned by enlistments.

Many properties have already laid plans for materially increasing their sales force. The economic conditions that exist to-day, particularly as affects household labor, have resulted in a much wider use of domestic electric appliances. Further to increase appliance sales and develop off-peak load has required more commercial men.

The feeling is very strong that the high cost of coal is sure to lead to increased popularity of electric cooking, especially in the use of smaller apparatus. Labor-saving appliances are being pushed more and more, and there is work enough for solicitors to do, especially in face of withdrawals for military service, past and prospective.

VALUE OF LOCAL TRADE IN PROMOTING RANGE SALES

Western Company Encourages by Special Inducements Contractors and Dealers to Boost Electric Cooking

Whether or not the electrical dealer and contractor is a factor at present in the development of electric range sales is a much debated question. Generally it is believed by the manufacturers and central stations that contractors and dealers must wait until the pioneering is done. However, there is one property in the West that believes the dealer and contractor are valuable assets in promoting range sales and therefore encourages the local trade to be on the outlook for this class of business.

This company feels that special inducement should be given to electrical contractors and dealers and other electrical men in order to get them to boost the electric range or the idea of "cooking by wire." It has electric ranges on display in about eleven electrical contractors' and dealers' stores and gives the contractor or dealer $5 commission on each electric range "prospect" he turns in when a sale is closed. The company feels that this helps it to a great extent, because it is estimated that approximately 5000 persons see these ranges on display and a large percentage of them inquire as to their feasibility, rates, etc. The electrical contractor recommends the electric range and assures inquirers that it is without doubt a success. A large number of the electrical contractors and dealers have purchased ranges themselves.

Recently this company invited the local electrical contractors' and dealers' association to hold its regular monthly meeting in its electric range store, inviting them to come at 6.30 p. m. Forty-three electrical men attended this meeting. The company served them with a very attractive electrical luncheon entirely cooked by electricity by its demonstrator.

The reason for the invitations to this luncheon was to get the trade to co-operate in boosting the electric range. This is the second luncheon of this kind that the company has had. After the regular business meeting, which was very short, talks were given on the electric range and how to promote its sale.

RETAIL DISTRIBUTION SHOULD BE ENCOURAGED

Suggested Method Whereby Central Stations Can Discourage Non-Electrical Dealers from Selling Inferior Socket Appliances

Milton Henoch of the appliance section of the Westinghouse Electric & Manufacturing Company, in a paper on the "Development of the Sale of Socket Appliances," read before the commercial men of the Indiana Electric Light Association at Fort Wayne, Ind., said in part:

"The dealer, the department store and the hardware store should be encouraged to sell socket appliances; this encouragement should come directly from the central station. The analyses of merchandising by this class of stores show that it is necessary for them to add an overhead of about 40 per cent, and naturally they will refuse to carry a line that does not show at least this percentage of profit. The result will be that they will stock inferior goods and will sell to the central station consumer, who naturally comes to the central station with his complaints. For this reason, together with the fact that the central station will profit continuously by the sale of appliances, I desire to recom-

mend that central stations encourage the practice of offering different classes of merchandisers a certain amount of cash upon presentation of a sales slip to the central station for the sale of a device on its lines.

"Assuming, for instance, the sale of a 6-lb. electric iron, the payment of 50 cents by a central station to the merchandiser would encourage the firm to conduct an electric department and carry a better class of socket appliances, for the reason that the cash assistance from the central station would permit him to buy a better class of goods."

Mr. Henoch also pointed out that after fifteen years of sales experience there seems to him to be no saturation point in the sale of electric appliances.

THE IMPORTANT DUTY OF MAKING FRIENDS

Upon the Management Is Placed the Double Responsibility of Having the Best Relations with the Employees and with the Public

BY WILLIAM E. KEILY

Perhaps no more important duty is laid upon the management of a public utility company than that of making friends for the enterprise. The art of making friends is very important in all avenues of life. It is very important in business—business of all kinds. But in no other field of activity is it more important to make friends than in the administration of public utilities.

Making Friends with Employees

This making of friends is a double function. First, the management of a public utility should make friends with its own people. The employees of the privately owned public utility company are expected, and often urged, to be loyal to the management. But it is always to be remembered that loyalty is strictly a "fifty-fifty" proposition. Those who expect loyalty must give loyalty. If the manager of a public utility organization desires the unswerving loyalty of the men under him—and what manager does not?—he must himself be thoroughly and deeply loyal to those men. He must advance their interests, consider their place in the scheme of things, plan so that they will get a fair proportion of the wages of the utility, and see to it that the deserving have opportunity for advancement. This spirit should be manifested by the heads of all departments. Every man or woman in the organization should stand in the attitude of a man with both arms outstretched, one hand reaching toward the man higher up and the other toward the man lower down.

This attitude should be typified throughout the whole organization. The stockholders may be considered as a body of men and women thoroughly loyal to the body politic and at the same time friendly to the utility corporation in which they have invested their money. The directors form the link between the stockholders and the president. The latter reaches up to the directors and down to his subordinate executives. These in turn have a helping hand for the heads of the departments, the latter for the subheads of departments, and so on. The men in authority must have interest in advancing the men beneath them and not confine their efforts to advancing their own interests.

In a recent issue of *Pearson's Magazine*, Guido Bruno has an instructive article on "Thomas Alva Edison: The Man." This article is headed by the following personal message from Mr. Edison: "The boys here work with me, not for me. All of us are co-workers for the prosperity of our country and for the world." In this article Mr. Bruno tells about an interview with Mark M. Jones, who has charge of the employment offices of the Thomas A. Edison laboratories and factories. The writer quotes Mr. Jones as follows:

"There are three words taboo in our factories—authority, welfare and employee. We have changed authority to responsibility. Even the man who sweeps the floor must feel the responsibility of his job, the urgent necessity of doing his work well, to enable all others to work in cleanliness. There is no such thing as welfare. It smacks of charity. We put betterment in its place. The lowest as well as the highest of us is seeking betterment throughout life. And employees? Co-workers sounds better and comes nearer to the real relation between ourselves and our men."

There seems to be food for thought in the foregoing statement.

Making Friends with the Public

It is obvious that it is also of the very first importance for the utility to make friends with the public it serves. Friendship is partly instinctive. Every person knows whom he likes and whom he does not like. We all remember Tom Brown's declaration in rhyme:

> I do not love thee, Doctor Fell,
> The reason why I cannot tell;
> But this alone I know full well,
> I do not love thee, Doctor Fell.

The utility does not want to be the "Doctor Fell" of its community. Antagonism is none the less dangerous, probably more dangerous, if it is ill-defined and unreasoning.

The conduct of the utility should be such that the general public, the great majority of the people, will have an instinctive feeling of friendliness, and not of unfriendliness, toward the utility. If the utility is the fortunate possessor of this feeling of general friendliness, it will have an asset of almost priceless value.

This friendliness must be deserved, of course. If the utility is for the people, the people will be for the utility. "By their fruits ye shall know them." The utility should seek confidence, should seek to be trusted, and should demonstrate to the average man that it is worthy to be trusted. It will not ever be able to please everybody; but it must be the exponent of the "square deal," and the people must have it borne in upon them that this is true.

Cultivating friendship must be done with the friendly desire to obtain friends. It will be of no lasting avail to assume a sham friendship for business expediency. A mock friendship deceives no one very long. What is needed is a deep, earnest desire for reciprocal friendship—a friendship that gives as well as takes—and the simple courage necessary to make that purpose known despite the possible sneers of the malicious and of the cheap-wits.

The utility that learns with honest helpfulness the art of making friends—making friends with its own people and with the public it serves—will have little to fear in performing its service for the public and in retaining a legitimate profit for doing that service.

OHIO PROGRESS TOWARD STANDARD VOLTAGES

Standard Voltage Statistics Compiled as of June Last Show 78 per Cent of Stations Operating on 110, 115 or 120 Volts

In the report of the committee on standardization of voltages, Ohio Electric Light Association, S. E. Doane, chairman, made at the recent convention, the situation in Ohio, with respect to the rest of the United States, was brought out. The progress of voltage standardization in Ohio is shown below in the comparison of the trend of Ohio stations with those of the remainder of the United States as of March, 1916, October, 1916, and June, 1917:

	Percentage of Central Stations Operating on Standard Voltage		Percentage of Population Served on Standard-Voltage Circuits	
	Ohio	U. S.	Ohio	U. S.
March, 1916	57	61	65	53
October, 1916	68	64	71	56
June, 1917	78	66	75	60

This seems to indicate that Ohio is somewhat ahead of the country in this standardization movement and that Ohio has made considerable progress in this direction since March, 1916. In these figures three voltages are considered as standard, 110, 115 and 120. Companies operating on one or the other are considered to be operating on standard voltages.

CENTRAL STATION VOLTAGES NOW PREVAILING

A further analysis, showing the voltages at which the Ohio central stations reporting are operating as indicated in June last, follows:

Voltage	Number	Station Percentage
100	2	0.5
104	2	0.5
105	3	0.7
106	1	0.2
107	1	0.2
108	4	0.9
110	202	45.6
112	29	6.5
113	9	2.0
114	5	1.1
115	134	30.2
116	4	0.9
118	12	2.8
120	9	2.0
122	1	0.2
125	2	0.5
170	1	0.2
220	20	4.6
225	1	0.2
230	1	0.2
Total	443	100.0

The following changes of voltage of Ohio central stations are indicated from October, 1916, to June, 1917:

Voltage	Number of Stations
108 to 110	2
110 to 112	1
112 to 115	4
113 to 115	1
110 to 115	1
114 to 115	1
116 to 115	2
115 to 110	3
125 to 112-115	1
Total	16

It is interesting to note that 65 per cent of the changes were from off voltages to standard voltages, and that there was only one change from a standard voltage to an off voltage.

GETTING READY FOR THE CHRISTMAS GIFTS

Many Companies in Different Parts of Country Co-operated in Preparation of N. E. L. A. Commercial Section Booklet

The Commercial Section of the National Electric Light Association has issued sample copies of its 1917 Christmas booklet.

F. D. Pembleton, chairman publication committee, writes that many companies in different parts of the country have co-operated in preparation of the booklet. This year, with constantly increasing costs of paper,

CHRISTMAS BOOKLET OF N. E. L. A. FOR 1917

printing, etc., Mr. Pembleton says that central stations will find the effective and practical booklet especially economical.

Shipments will be made well in advance of the Christmas season, insuring deliveries in ample time for early distribution to customers.

The price, f.o.b. New York, ranges from $3.60 for 100 copies to $16.50 per 1000 in quantities of 50,000 and over.

MANY FLAG RAISINGS IN THE MIDDLE WEST

Central Stations Conduct Patriotic Ceremonies in Which Employees Participate—Typical Program at Indianapolis

Throughout the Middle West central station officials and employees have been participating in flag-raising ceremonies. Power house roofs, tall office buildings and even special steel flagpoles are being used to float the flag above the entire community.

A typical ceremony was that at Indianapolis. Music was supplied by the Indianapolis police band. The address of presentation was made by Frederick L. Ray, superintendent of plants, and the 12.5-ft. by 25-ft. flag was accepted by L. G. Rothchild, special representative for the company. In addition to the officials and employees of the Merchants' Heat & Light Company, the employees of several other large industrial concerns were present, making a total of 600 people. The flag flies 132 ft. above the ground over one of the company power houses.

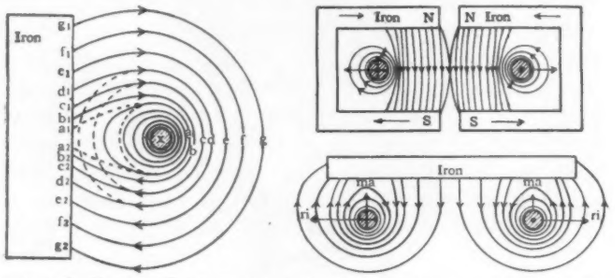
ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

MECHANICAL STRESSES BETWEEN CONDUCTORS

Attraction or Repulsion Under Ordinary Bus Conditions Does Not Become Important Until an Amperage of 25,000 Is Reached

UNDER ordinary bus conditions, says K. C. Randall in the *Electric Journal* for July, when the conductors are rarely less than 12 in. (30.5 cm.) apart, the mechanical stress of attraction or repulsion does not assume important proportions until some 25,000 amp. flows. With the exception of low-voltage plants, such a high current can be obtained only from large generating plants or networks, and then only near the stations, as the reaction or resistance of the circuit will limit the current. If, as shown in Fig. 4, the relative space occupied by the iron is large, the force of attraction due to it will be greater than the force of repulsion between the two conductors, and the latter will tend to close against the iron mass. The effect of the iron in Fig. 2 is to alter the distribution of the field surrounding the conductors and to attract the conductors to it as indicated, but the repulsion between conductors will not be materially changed from the value for free air. The author points out that wherever iron is interposed between conductors the tendency is to diminish the repulsion between them; and, conversely, whenever iron is placed above or below the conductors, paralleling their plane, the effect is equivalent to diminishing the distance between the conductors, and hence they will repel each other with greater force than in free air.



FIGS. 1, 2 AND 3—EFFECTS PRODUCED BY CURRENT-CARRYING CONDUCTORS IN THE PROXIMITY OF MASS OF IRON

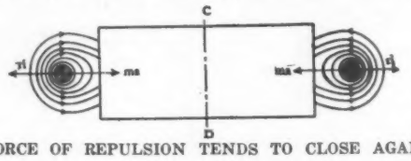


FIG. 4—FORCE OF REPULSION TENDS TO CLOSE AGAINST IRON

The diagrams discussed in this article by the author show that the addition of the iron may cause a decrease or an increase in the repulsion between conductors. The result, it is pointed out, depends upon the distribution of the iron, and sometimes on the quantity, in case saturation is involved. Eddy currents in the iron masses invariably increase the repulsion of the conductors, as their direction must be opposite to that of the conductor producing them.

Iron appears in the concrete structure as a reinforcement, and the usual disposition will not affect the normal forces between conductors. Even if in a position to increase the forces, the iron will not be in sufficient quantity to affect them materially. In the design of structures for conductors likely to carry large currents it is not advocated that iron in the proximity of the conductors be used in any formulas to reduce the calculated amount of stress between conductors. On the other hand, it is not believed that under the same circumstances an addition should be made to the calculated air value to allow for the presence of iron. Eddy currents in adjacent iron may add to or subtract from the repulsion between conductors, the effect being estimated as not exceeding 1 per cent of free air repulsion.

Lamps and Lighting

Some Observations on Office Building Lighting.—S. G. HIBBEN.—An important step can be made in office building lighting by the architect and engineer conferring regarding the location of outlets. Frequently the deciding factor in the choice of fixtures is the ease of cleaning and low maintenance cost. Quality of illumination and appearance of fixture are also important. The cleaning cost is one of the largest items of maintenance. However, the money is well spent, because where maintenance is not good an increase of illumination amounting to 30 per cent has been obtained when fixtures are cleaned. To facilitate cleaning attention should be given to the construction of the fixture and the relative positions of the bowl and lamp. In many offices there is a tendency to mount the lamps too low. It is usually good practice to employ no more than three sizes of bowls and no more than four sizes of lamps to simplify maintenance. Care in selecting the interior finish of a room is very important. For instance, the substitution of cream-colored for green walls will increase the desk illumination by 17 per cent. Substitution of ivory white for cream-colored walls will net an increase of 12 per cent in illumination, and the substitution of ivory-white ceilings and cream-colored walls for cream ceilings and green walls will net an increase of 32 per cent in illumination. With totally inclosed globes the substitution of cream colors for green walls increases the desk top illumination to 27 per cent.—*Transactions* of Ill. Eng. Soc., June 11, 1917.

Traction

Spring Lake Marine Railway.—JACOB A. HARMAN.—Description of an electrically operated installation serving the same purpose as a marine lock, but costing less to install and operate. It is situated in the Illinois

River valley and connects the river with a lake shut off therefrom by a levee. In general, the marine railway consists of an inclined track leading up each slope of the levee to a turntable on the summit of the levee. A cradle, or boat carriage, is mounted on wheels so that it can be lowered on these inclines into the water to receive the boats, raised to the turntable, rotated thereon, and lowered to the water again on the opposite side of the levee, keeping the boat in its natural position throughout all of this operation. An electric hoisting engine for hoisting and lowering the boat carriage and an electric swinging engine for rotating the turntable are housed in a reinforced concrete building alongside the turntable.—*Gen. Elec. Review*, July, 1917

Electric Traction on the Great Italian Railways.—CARLO M. LERICI.—The Italian railways have been the first in Europe to make use of electric traction upon main lines. Electrification has been carried out upon mountain lines offering specially great difficulties from their profile and where steam had proved itself entirely inadequate even with the newest equipment. In this article the author enumerates the Italian lines where electric traction has been instituted. The chief of these are four in number—the Mont Cenis line, the line starting from the port of Savona, the old Giovi line, and the extension of the Giovi line. The first of these lines has the largest mountain section, the second is built over the most varied route as regards change of grades, the third includes the steepest ascent to be found on any great European line, and the fourth has the heaviest traffic in Italy. The system used is, the author says, typically Italian. It is three-phase, two phases being aerial and the third furnished by the rails, with a frequency of 16.7 cycles and a tension of 3700 volts. The locomotives are furnished with motors of the Gallileo Ferraris type with revolving field.—*Revue Gen. de l'Elec.*, April 28, 1917.

Installations, Systems and Appliances

Electric Drive for Cotton Mills.—J. E. MELLETT.—An account of a study of power requirements in different departments of cotton mills, with suggestions as to the best method of applying motors to different machines. Electrical installation costs are given for a number of cases, the figures being given for the motor equipment and distribution system. The cost of heating mills is also brought out. Advantages of central-station service are included, lower operating cost, improved quality of product and increased production being emphasized.—*Gen. Elec. Review*, July, 1917.

Granular Carbon Electric Furnace.—SAMUEL A. TUCKER.—Brief description of a furnace for maintaining temperatures considerably above those possible with wire-wound furnaces. It consists of a refractory receptacle somewhat larger than the body to be heated, the intervention space being filled with carbon granules. At four diametrically opposite points in the receptacle are inserted carbon electrodes.—*Met. and Chem. Engineering*, July 1, 1917.

Wires, Wiring and Conduits

Permissible Currents for Underground Armored Cables.—R. V. PICOU.—The chief factor influencing the stationary temperature attained by a buried cable is the nature of the surrounding medium. The author adopts the hypothesis that the isothermal surfaces are concentric circles with the cable as axis, and that at a distance = 100 × radius, the effect of the heating is negligible. The permissible current can be deduced from the equation—

$$i^2 = \frac{2\pi}{\rho} \frac{s\Delta\theta}{\sigma_1 \log_e N + \sigma_2 \log (R/r)},$$

where $N = R'/R'' = 100$ (by hypothesis), and σ_1 and σ_2 are the specific thermal conductivities of the soil and insulation. Kennelly, Teichmann and Humann have made experimental determinations of σ_1; of these Kennelly's are considered the more correct. For σ_2 account is taken of the values obtained by Melsom and Booth, Atkinson and Parker, and Powell. The permissible currents for single cables are calculated taking $\sigma_1 = 200$ (15 per cent moisture) and $\sigma_2 = 230$. For multiple cables, with n equal conductors, the term $\log_e R/r$ is replaced by $\frac{n}{2} \log_e \left(\frac{a}{nr} \frac{R^{2n} - a^{2n}}{R^n a^n} \right)$, where r and R are respectively the radius of conductor and of lead sheath, and a is the distance between the axes of the cable and the conductors. The temperature rise allowed is 40 deg. C., which with a soil temperature of 10 deg. C. gives maximum temperature of 50 deg. C. Tables of permissible current are given for single, twin, three-core and four-core cables (10 to 250 mm.² cross-section), with different thicknesses of insulation, also factors to be applied when several cables are laid together. From these the author deduces a table of values which in practice can be considered as approximately correct up to 20,000 volts.—*Revue Gén. d'Élec.*, March 17, 1917.

Electrophysics and Magnetism

Convection of Heat from Small Wires in Water.—Results of an investigation to determine the laws of forced convection of heat from small wires moved transversely in water. When the velocity at which the wire was moved was in the range 6 cm. to 16 cm. per second and the temperature elevation of the wire not more than 23 deg. C, the linear heat dissipation was found to follow the law $P = 0.031\ O\sqrt{V}$ watts per linear centimeter. In this equation O is the temperature elevation and V is the velocity of the wire in centimeters per second, taking into account a certain experimental virtual velocity $vo = 1.15$ when the wire is at rest, and explainable as a velocity of free convection.—*Journal of the Franklin Inst.*, July, 1917.

Miscellaneous

Reconstruction of Factories in Invaded Territory.—The French national committee for the reparation of damage caused by the war has published a pamphlet by its vice-president, Léon Francq, dealing with the laws passed and proposed by the French parliament for bringing about rapid reconstruction and remanning of destroyed factories by means of indemnities and credits. It is pointed out that it would be a mistake to rebuild structures that were not well situated for their purpose or to re-establish industries where they could not be made successful. Central stations, for instance, should not be rebuilt on sites where the distance from an economical source of coal supply or from water power rendered them unremunerative. The electrical industry, which is concerned with the operation of so many manufactories of all kinds, is vitally concerned in the application of similar rules to all industries that it is proposed to re-establish.—*L'Industrie Elec.*, June 10, 1917.

Readers' Views and Comments

Taking Stock in Engineering

To the Editor of ELECTRICAL WORLD:

Sir: What would happen to a business employing upward of 100,000 men if it kept no books, took no inventory, balanced no accounts? You say it would fail. Probably so. Successful business must be able to answer the question, Does it pay? If not, why not? But to-day any business that is to continue to live must prepare to answer also the question, Does this business pay the employees? Upon the answer to this question depends the right of the business longer to exist.

One hundred thousand technical men, approximately, employed in engineering work in this country are now asking with regard to their work, Why does it not pay? With reference to their problem they are in the position of the business man who has no system for balancing accounts but who feels that he is failing. He knows in general that his particular line of endeavor is not bringing him personal success; he knows specifically that he can no longer pay his bills.

Several years ago systematic action was taken to induce technical men to take up the study of their relations to the engineering profession and of the profession to society, with a view of bettering both relationships. This action has been fruitful to the extent that technical men have turned their thoughts toward problems other than those having to do with bridges, buildings, machinery, steam and electricity. They are asking, "Why does engineering work not pay the men employed in it? Why does it not bring influence and respect?" They are taking an inventory of engineering; they are finding out why the business does not pay. At least they are considering some of the more conspicuous items of assets and liabilities. There are springing up throughout the country independent organizations of technical men having varied purposes, but each aiming to discuss the common question, "What is the matter with engineering work and what is the remedy?" These organizations are largely among employees. They are fair-minded. They are looking to the elevation of the engineering profession. They are also human and expect their work to pay them financially. They do not expect to take their pay from the employer, but from the ultimate consumer; but it must come through the industries, their employers.

To this problem are attached great individual interests, but it reaches farther than the individual. It concerns the profession; it concerns industry and business; it concerns our educational institutions.

What is to be done about it? Will the engineering profession act as a unit and employ such measures as will place it in a more estimable, economic and civic relation to things as a whole, or will the profession let the rank and file of employees solve the problem alone? If so, will they look first to the ethics and ideals of engineering, or will they join with organized labor in order to answer their question of bread and butter? The latter outcome might prove a calamity to engineering work. It would secure increased compensation for employees, but it would add another factor to the present condition of industrial intrigue, and it would split the engineering profession into two hostile camps.

There are in this country, say, 100,000 men engaged in engineering work. These men cannot all become employers without a proportionately larger number becoming employees. There must remain, therefore, as now, a large percentage of technical men in the employ of individuals, corporations and the government. Most of these men will do more or less routine and systematized work. They must be paid a wage that will enable them to live decently, keep their self-respect and raise a family. If these men continue to sell their services in the open market, they cannot hope to buy back at organization prices their pro rata of the products of organized labor, organized production and organized industry.

It certainly is no credit to the engineering profession that employees therein are not paid commensurately with organized labor. There would be no discredit attached to the profession if the welfare of employees were to be given due consideration.

The successful solution of this problem must be national in extent.

It must consider the interests of all parties—employers, employees, industry, civic activities and educational institutions.

It must include all branches of engineering.

It must provide sufficient compensation for engineering work to make it pay, attract better men and keep the best of those already engaged in it.

It must place engineers employed in public work in a more estimable position.

It must maintain high standards of professional ethics.

It must instill into engineers a sense of civic duty and equip them to perform that duty.

Such a solution can be approached only when all interests are represented. A commission of men from the great engineering societies of the country could be made representative of employers, employees, public work, industries and education. The work of this commission could be and should be financed by the engineering societies. It is to their interest that they should do so. As soon as the younger engineers realize that the national societies are injecting the idea of humanity into engineering work, they will feel that the associations have something to offer to them which is worth while. They will give their support morally and financially. There will then be no need of separate organizations to fight out these problems. The profession will be a unit. C. E. SCHUTT.

Chicago.

Expansion of the Hydro-Electric System in Ontario

To the Editor of ELECTRICAL WORLD:

Sir: The negotiations which have been pending for some time past in regard to the acquisition of a power-producing plant by the Hydro-Electric Commission have culminated in its purchase of the assets of the Ontario Power Company of Niagara Falls. This purchase has been found necessary to render practicable the commission's project for the construction of a power development at Queenston. By no other means could there be secured for that development a share of the permissible diversion of water from the Niagara River.

The Hydro-Electric Commission has not heretofore produced much energy, but has purchased from the Ontario Power Company most of the electrical energy which it has been distributing through its transmission and transformation system to a number of cities and villages in the Niagara peninsula. The company has since 1908 provided the commission with power up to a total of 100,000 hp. at the very low price of $9 per horsepower. The Ontario Power Company sold the rest of its plant capacity to other customers at much higher rates, which are understood to have been not less than $12.50 and as high as $16 in some cases.

The result of the purchase of this company's rights and business will be the eventual discontinuance of its plant at Niagara Falls and the diversion of the water to which it is entitled through a new line of conduit to Queenston Heights. The water which the power company was empowered to utilize is 11,180 cu. ft. per second. This flow permitted of a development of about 180,000 hp. on the fall of 160 ft. at Niagara. At Queenston Heights the same volume of water will have an increased fall and upon a total head of 310 ft. will develop about 390,000 water hp. or 300,000 electrical hp. The cost of the Queenston conduit and plant, it is stated, will be about $15,000,000 or about $50 per electrical hp.

If completed for this expenditure, it will be in itself a very economically developed source of water power. Such a moderate cost substantiates the policy outlined in "An Expensive Experiment," Chapter III, page 61, of eventual removal of all of the water-power developments from the falls and their replacement by others, making a larger and better utilization of the water diverted, at Lewiston and Queenston, below the rapids. But this removal does not relieve the new development from the investment in the existing plants, and in this case we can see in what position the Hydro-Electric

Power Commission will find itself as regards the cost of energy upon the completion of the Queenston plant.

The Hydro-Electric Commission purchased and sold in 1915 about 80,000 electrical hp. at the price of $9, and was entitled to 20,000 hp. additional at the same figure. During 1916 it is stated that the demands for munitions factories increased the sales of the commission to a total of about 150,000 hp. Of this, 100,000 hp. cost $9, and 50,000 hp. was taken from the Canadian Niagara Company at $12 per horsepower, an average price of $10 per horsepower.

The price at which the Ontario company's property and franchise has been acquired is $4,230,000 less than its book value, and if it continued as a going concern with better prices for its output, it might be made to return a fair income. As it is, the company earned in 1915 only a gross revenue of $2,396,277; its operating expense was $894,924, or about 37 per cent, or $4.90 per horsepower, leaving $1,501,353 net income to meet all fixed charges.

The bonded indebtedness is $14,669,000, the annual interest upon which is $767,118, or about 5¼ per cent. Depreciation at 3 per cent absorbs $438,000. These items would leave only a return of 2.96 per cent on the common stock. The bonds represent the approximate cost of the Niagara plant, which under the new conditions is to become a total loss. For the rest of the assets of the company, which include its water rights and $10,000,000 of stock, the commission exchanges $8,000,000 of provincial bonds which are now carrying interest at the rate of 5 per cent, and require the usual sinking fund on thirty years' amortization, at the rate of 1.8 per cent per annum. The business, if continued, would fail by $248,000 to meet these charges.

The cost of the new development at Queenston must also be provided by the issue of more provincial bonds, and when completed must carry the expense of the purchase of the power company's business.

The property of the Ontario company has been taken over at a cost of $126 per horsepower of capacity, and the cost of the Queenston project added thereto will bring the cost of developed power capacity, notwithstanding its increased scale, to about the same figure,

The total expense of the new scheme will therefore be close to $38,000,000, and the accompanying fixed charges are such that the cost of the production of power will be increased rather than diminished by the new development. The interest on the bonded indebtedness taken over by the commission, and upon the provincial bonds issued for the purchase and for new construction, will amount to $1,917,000 per annum, or upon the new development when completed $6.39 per horsepower. If the sinking fund is applied to the provincial bonds at the thirty-year rate, it will add an annual expense of $414,000, or $1.38 per horsepower. Depreciation must include some suitable provision to wipe off the cost of the abandoned plant at the Falls, and at the low figure of 5 per cent per annum on the bonds outstanding this would amount to about $733,000 per annum. If depreciation on the new plant is provided at the rate of 3 per cent, the effect would be to add to the fixed charges $3.94 per horsepower per annum.

The cost of operation and maintenance of the company's plant has been at about $4.90 per horsepower, which, added to the fixed charges, will make the total cost $16.57 per horsepower, which is greatly in excess of the price at which the commission has heretofore purchased its servce.

The commission has doubtless been forced into this situation by the rapidly increasing demands for energy, due partly to the natural expansion of business in Ontario and partly to its unduly low prices. It has been selling energy at an average price of $20 per horsepower, which is less than the full costs when purchased at an average price of $10 per horsepower. Its political future is bound up with the maintenance of the low prices at which it disposes of the energy, and its situation practically compels it to find energy to meet any demands. Thus, as the capacity of the power companies at Niagara is insufficient to meet the growing demands, fostered by the commission's methods, the only recourse was the arbitrary means used last fall with the Canadian-Niagara Company of commandeering 50,000 hp. at a price lower than that company had contracted its sale. The other companies are fully occupied in producing energy for Toronto and Hamilton needs. The commission has therefore been compelled to buy out the Ontario Power Company and to find means of increasing its capacity. But thereby it loads the new venture with the cost of a disused plant. These political and commercial necessities of the situation appear to be the justification for the transaction which has just been concluded. From a financial standpoint its result can only be to increase the cost of production and advance the eventual necessity for raising the price of energy on the Niagara system of the commission.

REGINALD PELHAM BOLTON.
New York.

Keeping Copper in Full Service

To the Editor of ELECTRICAL WORLD:

Sir: An editorial article printed in your paper some time ago, under the heading "Engineering Aspects of the Copper Situation," suggested to me a possible solution of the problem of conserving the unconsumed electrical energy that is constantly going to waste during certain hours of the twenty-four. In a great measure it would do as you suggest, "keep copper in full service." It would help carry the peak load and equalize the system at all times. The answer is storage batteries.

In this Western country all the plants may be said to be hydroelectric with large investments in long transmission lines. Would it not be perfectly feasible to install large-capacity storage battery plants near the consuming centers, thereby keeping the electrical charge on the transmission lines practically constant during the entire twenty-four hours? Of course, there are a number of related questions, such as voltages, direct and alternating currents, etc., that would require special treatment, but, leaving them out by presuming that they are all subject to satisfactory solution, is it not possible so to harmonize cost of storage battery installation with the other factors entering into the problem that it would pay to do this? J. C. BROWN,
Ogden, Utah.

The Grate That Comes with the Boiler

To the Editor of ELECTRICAL WORLD:

Sir: In designing a boiler room of a power plant for generating steam one of the most important factors affecting combustion efficiencies in after days is that of the combustion chamber and boiler setting. The rational way to design the combustion chamber and boiler setting is upon the characteristics of the coal that is to be used. The coals in nearest proximity to the proposed plant, freight rates of the local railroads and other factors connected with cost and delivery of fuel are investigated. The coal best suited to the case on hand, upon a basis of minimum cost or maximum heating value, or sometimes both where severe peak loads may require two different grades of coal, is then decided upon. Knowing the characteristics of the coal to be burned, it is then possible to lay out the combustion chamber and boiler setting for the most advantageous use of heat and a minimum of smoke. It is not always feasible to resort to one grade of coal only, because of possible embargoes, inadvisability of depending upon one route, etc., and the settings and combustion chamber may then happen to be a compromise.

Not only the boiler setting and the furnace chamber alone effect combustion, but the grate plays a large part in efficient combustion and economical operation and low upkeep. Where a fine grade of coal is used with a coarse grate, the loss of carbon in the ash may be needlessly high. Losses due to wasted coal, unequal fires which may cause excess air and rapid deterioration of the grate bars are also items that the proper grate tends to prevent. Yet, notwithstanding this, the boiler manufacturers usually sell the grate as an integral part of the boiler, taking no cognizance as to the fuel to be used.

In the interests of the purchaser, of the manufacturer and of economy surely it would be better and more satisfactory to every one concerned if the boiler were not sold integral with the grate, but if instead the grate were available in different types for whatever grade of fuel was to be used.

Chicago. J. C. RUTHERFORD.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

HAMPTON ROADS NAVAL BASE ELECTRIC LIGHT AND POWER

H. R. Palmer, General Superintendent Light and Power of Virginia Railway & Power Company, Tells Construction Requirements

H. R. Palmer, general superintendent light and power, Virginia Railway & Power Company, writes in answer to a letter of inquiry from the ELECTRICAL WORLD that the arrangements for lighting and power at the Hampton Roads naval base have not yet been completed. At this time the following material will apparently be required for outside construction:

40,000 ft. No. 4 weatherproof wire.
7,000 ft. No. 6 weatherproof wire.
3,000 ft. three-conductor No. 6 2300-volt lead cable.
3,000 ft. fiber conduit.
20 standard underground No. 4 outdoor cable pot-heads.
30 25-kw. transformers.
6 50-kw. transformers, primary 1100/2200, secondary 122/244.
3 300-kw. transformers, 11,000-volt to 2300-volt.
100 35-ft. poles.
150 cross-arms.
500 2300-volt insulators.
300 11,000-volt insulators.

In addition to the above, a transmission line approximately 5 miles (8 km.) in length, 11,000-volt, with submarine cable crossings, estimated cost $20,000, will be required. The distribution from the transformers to the buildings and all wiring will be done by an electrical contractor. The contract for this work will probably be let in a few days.

GOVERNMENT SERVICE OF SAN ANTONIO COMPANY

W. B. Tuttle Outlines Plans for Supplying Energy for Light and Power at Camp Wilson and Camp Kelly

W. B. Tuttle, vice-president San Antonio (Tex.) Gas & Electric Company, writes in answer to an inquiry from the ELECTRICAL WORLD:

The San Antonio Gas & Electric Company has submitted a proposal to the United States government to supply electricity for light and power at Camp Wilson. This proposal has not been formally accepted. The company is, however, already supplying light and power at Fort Sam Houston, adjoining Camp Wilson, and it seems probable that we will supply Camp Wilson also.

We proposed to build a three-phase, 60-cycle circuit direct from our Villita Street power house to the camp. This circuit will be about 4 miles (6.4 km.) long and will operate either at 6600 volts or at 13,200 volts, depending upon the load required by the government. In the vicinity of the cantonments the line will be transformed down to 2300 volts, and it is recommended that the government construct three single-phase, 2300-volt circuits along the road running through the length of the three sections into which the cantonments are to be divided. From these primary circuits it is recommended that secondary lines run down to the center of each block, so that each secondary will supply two battalions. In case power is required a third wire can be run into any point that may be necessary on any of the three single-phase circuits.

The company is already supplying electrical energy both for power and for light at Camp Kelly, the aviation post about 6 miles (9.6 km.) below the city. We have a three-phase line running out from our Concepcion Avenue station to this camp. This line is designed for operation either at 6600 volts or 13,200 volts, and we step down to 2300 volts before entering the reservation.

The water supply for Camp Kelly is furnished by an electrically driven pumping outfit.

ISSUE OF $15,000,000 NOTES BY GENERAL ELECTRIC COMPANY

Three-Year Loan to Provide for Demands of Largely Increased Business—Inventories Are Larger

An issue of $15,000,000 of three-year 6 per cent notes has been sold by the General Electric Company to J. P. Morgan & Company and Lee, Higginson & Company. The notes were offered for sale by the bankers at 99¾ and interest, yielding 6.10 per cent, and subscriptions are said to have aggregated $80,000,000. They sold up to 100¾ on the curb afterward.

The company issued the following statement:

The General Electric Company, whose practice it has always been to maintain a strong position with respect to cash assets, has just arranged a loan of $15,000,000 for three years to provide for the demands of a largely increased business.

The company expended nearly $9,000,000 upon additional plant facilities during the year 1916, and like expenditures for the present year will be considerably greater. Apart from this, its inventories have naturally greatly increased, and the slowing down of collections in the existing unsettled conditions will result in a more than normal increase in its accounts receivable.

The quick assets of the company, as shown by its last annual report, excluding securities, amounted to $97,000,000. Against this, it had indebtedness, excluding current liabilities, of $12,000,000.

RISING COSTS INFLUENCE THE CLEVELAND MUNICIPAL PLANT

Higher Wages Asked by Employees—Coal Estimated to Cost $300,000, Compared with $80,000 in 1916—Talk of Rate Advance

Employees of the Cleveland municipal light plant asked recently for an increase in wages amounting to about $60,000 a year. Commissioner of Light W. E. Davis granted an increase of about 12 per cent to seventy-five employees, whose wages, he felt, had not been advanced in proportion to increased cost of living.

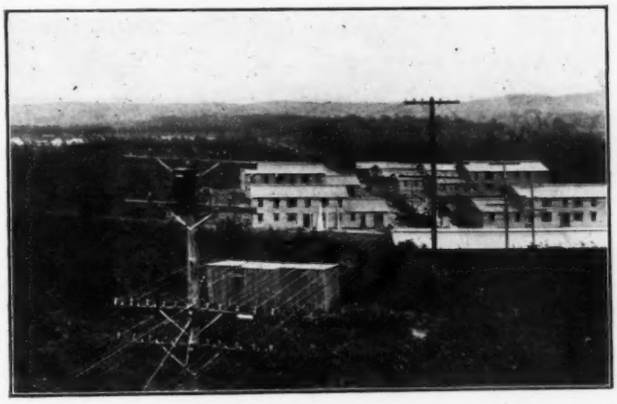
Coal for the plant cost $80,000 in 1916, it was stated, but this year the coal bill will probably run to $300,000. As the profits for 1916 are stated by the municipal plant authorities at $156,000, Commissioner Davis fears that the rate will have to be raised.

ELECTRICITY IN THE LARGE CANTONMENT AT AYER, MASS.

Extensive Application of Energy in the Camp for 37,000 Troops Near New England Power Company Line

The Ayer (Mass.) cantonment, which is being built at top speed by 5000 men to house 37,800 troops soon to be in intensive training, is one of the busiest spots in New England. Electricity is playing a prominent part in the construction. Through the courtesy of Capt. Edward Canfield, constructing quartermaster, U. S. A., in charge of the cantonment, the ELECTRICAL WORLD is permitted to outline some of the electrical features.

The cantonment, officially known as Camp Devens in memory of the distinguished Massachusetts soldier-jurist of the Civil War, is located southwest of Ayer village and about 2 miles (3.2 km.) from the junction of the Boston & Maine Railroad trunk lines serving all four cardinal points of the compass. The camp is



12,000-VOLT LINE FOR TEMPORARY ELECTRICITY SUPPLY AT AYER CANTONMENT

roughly 40 miles (64.3 km.) from Boston and within comparatively easy reach of the 66,000-volt transmission lines of the New England Power Company in northern Worcester County.

To permanently serve the camp a two-circuit steel-tower line 8 miles (12.8 km.) long is to be built from the Leominster district to the outskirts of the cantonment, where a substation containing three 500-kva. General Electric transformers will reduce the potential from 66,000 volts to 2300 volts for local distribution. Lighting and power service for a total of 1118 buildings will be furnished from this substation. Of these structures, 622 are to be completed by Sept. 1, the remainder consisting of stables, gun sheds and other auxiliary buildings which can be completed more conveniently after the various regimental quarters are established.

About 2,000,000 ft. (609,600 m.) of wire ranging in size from No. 0 to No. 14 B. & S. will be installed, and it is estimated that 30,000 incandescent lamps of 25 to 200 watts rating will be required. At least 1000 chestnut poles, mainly 30 ft. (9.1 m.) long, are being erected, and already induction motors are performing service in sawing lumber for the buildings. Besides five saws driven by gasoline engines, nine saws are in service belted to 7.5-hp. motors, and it is stated that the electrically driven saws are turning out more work than their competitors. For intensive lighting around the sawmill units 600-cp. to 1000-cp. General Electric "Novalux" lighting units are in service. A series incandescent lighting system will be installed in the camp streets as the work progresses.

A typical 7.5-hp. Westinghouse 220-volt, 1740-r.p.m. induction motor controlled by a Westinghouse starter and provided with a "Detroit" fuse and main switch cabinet is found in one part of the cantonment. This equipment drives a 12-in. (30-cm.) cross-cut saw by a short belt, the wiring being in armored flexible cable. The various saws recently cut up over 200,000 ft. (60,960 m.) of lumber in a thirteen-hour day. Lumber is delivered at the camp by rail, passed through the receiving yard or mill unit as required, and after sawing, it is hauled to the construction center required by United States Army motor trucks recently in service on the Mexican border. The sizes sawed ordinarily range from 2-in. by 4-in. (5.08-cm. by 10.16-cm.) to 3-in. by 12-in. (7.62-cm. by 30-cm.) spruce and hard pine.

One of the latest equipments to arrive at the cantonment is a lumber clipping machine equipped with a gang of eight saws and operated by a 50-hp. Westinghouse motor and three gasoline engines.

In the near future a sewage pumping station will be built not far from the camp and operated by a 100-hp. motor, and the water supply will require another pumping station equipped with two motors of 250-hp. and 150-hp. rating. This installation will be piped to the local fire service system so that either pump can be operated in case of fire for that service only. A well-equipped and motorized fire department is already a feature of the camp, and at the contractor's headquarters a fire observation tower equipped with telephone connections, binoculars, map, etc., is constantly manned. The camp is about 1.6 miles by 1.1 miles (2.5 km. by 1.7 km.) in extreme diameters. Besides the pumps above mentioned a 50-hp. motor-driven pump will be installed for standpipe service. Various motor-driven machine tools will also be required as the work progresses.

The New England Telephone & Telegraph Company estimates that a 100 per cent increase in the business of the Ayer exchange will follow the completion of the cantonment. There are two private exchanges on the camp grounds, one being required by the contractor and the other by the military authorities. The former consists of a two-position vertical board and a four-position order board serving about sixty-five local stations at present. From the contractor's headquarters ten trunk lines are run to Ayer, one to Springfield, Mass., and two to Boston. The military switchboard is housed in a telephone exchange building 20 ft. wide by 84 ft. (6 m. by 25.6 m.) long, equipped with the usual comforts of a standard city exchange and provided with storage-battery service and rectifier charging equipment. A twelve-position board of the latest type is installed.

F. A. Barbour is chief engineer of the civilian staff engaged in the cantonment construction, N. J. Neall of Boston being consulting electrical engineer. A. J. Hixon, Boston, is in charge of interior electrical installation work, and T. J. Daly of exterior distribution. The contractors for the camp as a whole are Fred T. Ley & Company of Springfield, Mass. R. R. Ringer of the latter organization is electrical purchasing agent.

DETAILS OF CONTRACT FOR SILVER LAKE CANTONMENT

Complete List of Electrical Material Necessary to Equip the 1054 Buildings That Will Compose the Army Structures Near Atlanta

The Silver Lake cantonment (Camp Gordon) is approximately 10 miles (16.1 km.) north of Atlanta, adjacent to the lake after which it is named. It is admirably situated with reference to climatic conditions, quick movement of troops and supplies, as well as to water supply, railways, good roads, power, telephone and telegraph facilities.

Contracts for the general construction of the cantonment camp have been awarded to Arthur Tufts of Atlanta, who in turn represents the electrical, street, sanitation and other contracting interests necessary for the successful completion of the camp in time to receive the recruits. Lockwood, Greene & Company are acting as engineers representing the government and are getting out specifications.

To take care of the passenger traffic between Atlanta and the cantonment it will be necessary for the Georgia Railway & Power Company to extend its trackage from the present terminus at Brookhaven. It has not been definitely decided whether this extension will be single-track or double-track.

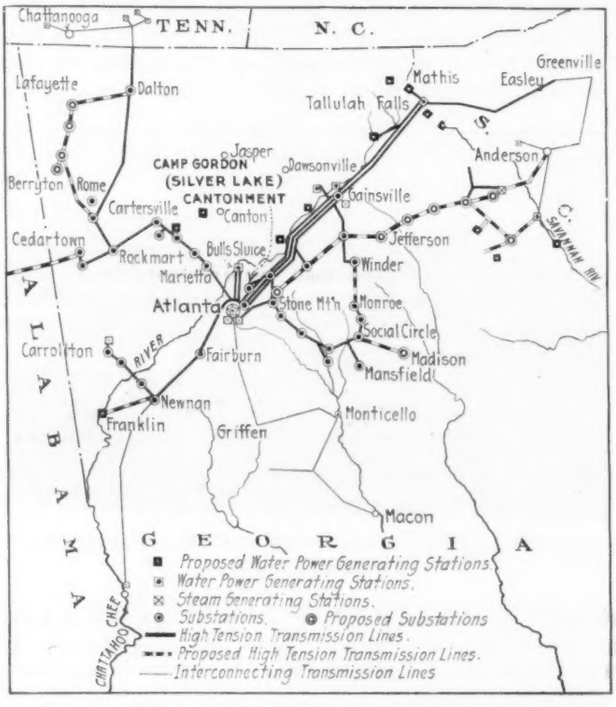
A new rotary substation will be erected in the vicinity of Buckhead, and energy will be secured from the company's existing Morgan Falls 22,000-volt, 25-cycle transmission line about three-fourths of a mile (1.1 km.) distant. Substation equipment will include seven 185-kva., 22,000/430/287/143-volt, single-phase, 25-cycle transformers and two 500-kw., 25-cycle rotary converters. Trolley wire will probably be 3/0 copper, but the weight of this wire and the length of feeder cable have not been fully determined.

Light and power for all purposes will be supplied by the Georgia Railway & Power Company from its present Boulevard-Gainesville 22,000-volt, three-phase, 60-cycle transmission line. The line extension will be made on 30-ft. (9.1.-m.) long-leaf creosoted poles, utilizing ¼-in. (6.3-mm.) galvanized-iron wire, triangular spacing with 5-ft. (1.5-m.) centers. A branch of the company's private telephone line will also be extended to the transformer station. The transformer substation will be at the west side of the camp and of the company's standard outdoor fabricated-steel type, including three 250-kva., 22,000/2300-volt, single-phase, 60-cycle outdoor-type transformers. It is estimated that this equipment will be ample to take care of all requirements.

Light and power will be needed for the camp during the period of construction, and the power company will handle this situation temporarily with three 1000-kva., 22,000/2300-volt, single-phase, 60-cycle outdoor transformers.

The camp will require large quantities of water, and the city of Atlanta is laying a 9-mile (12.9-km.) main from the Hemphill pumping station to the camp. About 4000 ft. (1,219 m.) of this main has been laid up to the present time, and over 2000 ft. (609 m.) of ditch is opened, waiting for material to complete the job. Material is not arriving so fast as was expected, but the work will be completed in time. Water from the Atlanta main will be stored at the camp in five 200,000-gal. (757,066-l.) redwood tanks. A separate water system of wood-stave pipe and cast-iron specials will be maintained. Normally 1600 g.p.m. (101 l.p.s.) will be required with a maximum requirement of 5000 g.p.m. (315 l.p.s.) during the stock-watering and shower-bath periods. Supplementing the Atlanta pressure, the following pumping equipment will be installed: one 300-g.p.m. (18.9-l.p.s.) and four 1200-g.p.m. (75.6-l.p.s.) centrifugal pumps direct-connected to alternating-current three-phase, 60-cycle, squirrel-cage induction motors. Neither the horsepower per motor nor the voltage to operate these motors has been definitely decided upon, as complete specifications have not been made up covering working heads.

A distinct fire department will be installed using combination gasoline fire trucks in connection with the regular street hydrants. The Western Union Telegraph Company is spending a large amount in extending its



MAP OF DISTRICT SURROUNDING CAMP GORDON IN GEORGIA

facilities to meet the requirements of the government. Special independent lines are being constructed and first-class operators will be provided.

Arthur Tufts, the general contractor, has awarded through the Atlanta Builders' Exchange to the Russell Electric Company a contract covering the entire electrical work to be done at the cantonment. This contract embraces the wiring of 20 miles (31.2 km.) of streets, the interior wiring of all buildings, the installation of motors, and placing and hanging of all fixtures.

In order to complete all electrical work on time, approximately 250 electricians will be required. The wages for electrical workers will be the same as now prevail in the city of Atlanta.

Wiring specifications will vary from time to time as work progresses, owing to the changes that will be made in the building arrangements, but the general requirements will be about the same, and it is estimated that the following list of material will be sufficient to do the work:

2,000 ball adjusters.
7,800 brass-shell key sockets.

9,500 cleat receptacles.
8,000 cleat rosettes.
1,800 combined switch and plug cut-outs.
4,000 Edison 100-amp. plug fuses.
1,000 Edison 6-amp. plug fuses.
600 lb. friction tape, ¾-in., black.
17,000 ft. lamp cord—No. 18 Standard N. E. C.
11,000 pr. porcelain cleats—glazed No. 10 single-wire.
190,000 pr. porcelain cleats—unglazed two-wire.
80,000 porcelain tubes—4-in. by 5/16-in. by 9/16-in. diameter.
1,000 plug cut-outs—two-pole, single-branch.
1,000 plug cut-outs—single-pole, main-line.
5,000 screws—round-head, blued globe, No. 8, 1½-in.
35,000 screws, wood—round-head, blued globe, No. 8, 1¼-in.
400,000 screws, wood—round-head, blued globe, No. 10, 2¼-in.
16,000 shades.
400 lb. solder strips.
2,000 wire lamp guards.
1,500,000 ft. wire, No. 14—rubber-covered, single-braid.
60,000 ft. wire, No. 10—rubber-covered, single-braid.
2,000 switches—single-pole snap with porcelain base.
20,000 40-watt Mazda lamps.

It is estimated there will be approximately 1054 buildings, divided between the various departments as follows:

Administration	16	Post exchanges	16
Barracks	212	School and assembly	16
Guardhouse	17	Shops	90
Hangars	12	Stable guard	23
Headquarters and supply	15	Stables	293
Lavatories	352	Stores	44
Medical	19	Wagon sheds	53
Officers	77		

Although specific plans are not ready covering all the electrical materials and load requirements, it is estimated that the following conditions will prevail and material as listed below will be ample to do the work, with the exception of changes that take place during construction:

Total maximum demand	750 kw.
Approximate lighting demand	300 kw.
Approximate power demand	400 kw.
Approximate series lighting demand	50 kw.

Although there will be more than 1000 buildings, it is estimated that 500 to 600 110/220-volt cut-ins will be sufficient.

It is probable that 400-cp. type C street lights will be used. The material required for street lighting, power and lighting service (exclusive of interior wiring) is listed as follows:

Two 24-kw. series lighting circuits, No. 6 wire, ft	115,000
Three-phase, 2300-volt power service, No. 1/0 wire, ft	30,000
Three-phase, 2300-volt power service, No 4 wire, ft	24,000
Single-phase, 2300-volt, two circuits, No. 6 wire, ft	28,000
110/220-volt secondary service, No. 6 wire, ft	105,000
Services—600, No. 8 wire, ft	120,000
Poles	800
Cross-arms, two-pin, for lamp leads	500
Cross-arms, four-pin, primary and arc circuits	1,100
Cross-arms, four-pin, secondary arc circuits	1,050
Cross-arms, four-pin, buck arms	200
Cross-arms, four-pin, transformer installations	250
Cross-arms, five-pin, three-phase, primary and series circuits	200
Cross-arms, braces complete with bolts, pairs	2,700
Throng bolts for double arms, ⅝-in. by 16-in	700
Throng bolts for single arms, ⅝-in. by 14-in	2,500
Square washers for through bolts	6,400
Locust pins, series lighting circuits	1,050
Locust pins, 2300-volt primary circuits	800
Locust pins, secondary circuits	1,200
Locust pins, drop leads to lamps	800
Locust pins, buck arms, etc	650
Brackets, 600 services	1,800
Break arms for street lights and tap lines	500
Deep groove insulators, on pins, brackets, break arms	7,000
Glass knobs, No. 2	500
Wood screws, No. 18, 3-in.; primary plugs, knobs, gross	4
Nails for 1800 brackets, lb	120
Porcelain tubes, ½-in. by 6-in., for primary and series leads	600
Friction tape, lb	100
Solder, lb	250
Ground rods with wood strips, lb	50
Lamp fixtures, goose-necks with radial wave reflectors	400
Lamps, series, type C, 100-watt	400
Strain insulators	600
Steel cable for guy wire, 5/16-in., ft	5,000
Sectionalizing switches, 2/0 Johnson clamps	10
Sectionalizing switches, No. 4 Johnson clamps	20
Sectionalizing switches, No. 1/0 R. C. flexible cable, ft	200
Sectionalizing switches, No. 4 R. C. flexible cable, ft	200
Transformers, distributing, 10-kva., 2300/110/220-volt	20
Transformers, distributing, 5-kva., 2300/110/220-volt	10
Transformers, distributing, 3-kva., 2300/110/220-volt	3
Transformers, distributing, 1-kva., 2300/110/220-volt	2
Lightning arresters, 2300-volt, compression type	100
Ground rods, complete with wood strips	50

As nothing definite has been decided upon with reference to power for refrigerating, bakery, laundry and miscellaneous purposes, it is impossible to state definitely what kva. capacity will be required. The accompanying map shows the relative location of the cantonment to the Georgia Railway & Power Company's transmission system.

STANDING COMMITTEES OF ASSOCIATED MANUFACTURERS

Members of the Membership, Finance, Legal, Taxation, Tariff, Entertainment and Advisory Committees Are Named

At a recent meeting of the board of governors of the Associated Manufacturers of Electrical Supplies, held at the offices, New York, standing committees for the ensuing year were appointed as follows:

Membership Committee—W. C. Robinson, chairman, National Metal Molding Company, Pittsburgh; C. H. Bowen, Collyer Insulated Wire Company, Pawtucket, R. I.; Oscar Hoppe, American Circular Loom Company, New York; H. T. Paiste, H. T. Paiste Company, Philadelphia; W. S. Sisson, D & W Fuse Company, Providence, R. I.; W. D. Steele, Benjamin Electric Manufacturing Company, Chicago; J. H. Trumbull, Trumbull Electric Manufacturing Company, Plainville, Conn.

Finance Committee—Charles Blizard, chairman, Electric Storage Battery Company, Philadelphia; W. C. Bryant, Bryant Electric Company, Bridgeport, Conn.; Charles L. Eidlitz, Metropolitan Electric Manufacturing Company, Long Island City, N. Y.; R. E. Gallaher, New York Insulated Wire Company, New York; J. Nelson Shreve, Electric Cable Company, Bridgeport, Conn.

Legal Committee—D. C. Durland, chairman, Sprague Electric Works, New York; D. H. Murphy, American Conduit Manufacturing Company, Pittsburgh; Gerard Swope, Western Electric Company, New York City.

Taxation Committee—J. F. Kerlin, chairman, National Carbon Company, Cleveland; J. W. Brooks, Pass & Seymour, Inc., Solvay N. Y.; Oscar Hoppe, American Circular Loom Company, New York.

Tariff Committee—J. J. Gibson, chairman, Westinghouse Electric and Manufacturing Company, East Pittsburgh; L. Livingston, Edward F. Caldwell & Company, Inc., New York; J. E. Way, R. Thomas & Sons Company, New York; F. H. Chapman, Yost Electric Manufacturing Company, Toledo, Ohio; S. H. Blake, General Electric Company, Schenectady, N. Y.; E. F. Wickwire, Ohio Brass Company, Mansfield Ohio; R. C. Buell, Johns-Pratt Company, Hartford Conn.

Entertainment Committee—D. C. Durland, chairman, Sprague Electric Works, New York; LeRoy Clark, Safety Insulated Wire & Cable Company, New York; J. W. Perry, H. W. Johns-Manville Company, New York; Charles E. Dustin, general secretary, New York, and the president, ex officio.

Advisory Committee—LeRoy Clark, Safety Insulated Wire & Cable Company, New York; D. C. Durland, Sprague Electric Works, New York; J. W. Perry, H. W. Johns-Manville Company, New York; R. K. Sheppard, Simplex Wire & Cable Company, Boston; Charles E. Dustin, general secretary, New York.

WAR CONVENTION OF THE OHIO ELECTRIC ASSOCIATION

Conference on Questions of Central Station Policy Supplants the Usual Large Meeting— O. H. Hutchings Elected President

Modified by war conditions, with program and attendance restricted, the meeting of the Ohio Electric Light Association at the Deshler Hotel, Columbus, on July 19 was nevertheless a conference on central station policies and practices which was of much value to the members. It took the place of the large annual convention which was to have been held at Cedar Point during the week. The National Electric Light Association was represented by George B. Muldaur, field secretary.

ADDRESS OF PRESIDENT BECHSTEIN

President E. A. Bechstein, Sandusky, in the annual address of the president, expressed regret that the usual convention was not being held. A majority of the executive committee felt that a five-day gathering with attendant social activities when the country is at war would be in rather questionable taste and would involve expenditures that, under the circumstances, might be considered wasteful. He did not altogether share this view; he had always regarded the association as a working organization and its conventions as primarily devoted to the interests of the electrical industry, with social and pleasurable features as merely incidental. After the executive committee had acted, the letter from President Wilson was made public strongly urging associations of business and professional men to hold their conventions as usual. Mr. Bechstein regretted that the committee did not have the benefit of the President's views at its meeting.

President Bechstein said in part:

Our part in the war will be no small one. It will be our duty to supply the wheels of industry with power in order that those who are making the things needed for the men in camps and at the front may perform their work efficiently. We must also furnish a large part of the power to transport food, supplies, munitions and men to the places where they are needed. The constructive forces of the country are co-ordinating as they never have before, and the failure of even one part of the great industrial machine may cause delay and loss to all other parts.

From a small central station in Ohio to the battle lines of France and Belgium is a far cry, but the failure of even the smallest station to perform its duty at a critical moment may mean the loss of many lives and prolong the struggle in which we are engaged. So the year to come will call for greater efforts, greater vigilance, greater co-operation than ever before. The loyalty of the men of the industry has already been demonstrated in their liberal subscriptions to the Liberty Loan and Red Cross, and it will be demonstrated time and again as the calls of national necessity arise. But it is not enough to be merely loyal. We must work as we never worked before in order to "hold up our end" in the great struggle.

Near the beginning of the present calendar year the entire industry was thrown into a state of confusion by a sudden sharp advance in the cost of labor and materials. This came so unexpectedly that there was no opportunity to prepare for it; and for a time it was a serious question whether or not a considerable number of stations would be obliged to shut down. The advanced cost of fuel was particularly distressing, that essential commodity doubling in price almost over night. With the increased cost came a vexing uncertainty about deliveries. Many of us led a hand-to-mouth existence with regard to fuel for several months, and some of us did not know at times but that we might be forced to suspend operations for lack of ability to get coal at any price. In some sections, also, it was next to impossible to procure and hold labor. This condition still exists, and one of the big problems ahead of us is to find a way to overcome this serious handicap.

There remain the problems of labor supply and deliveries of fuel and other essential supplies. As to the former, little can be done until the reorganization of all industries has made further progress.

As to deliveries of fuel, it seems to me that some means of insuring them to all central stations should be devised. We are providing a service of such vital importance to every other branch of industry, a service upon which practically the whole population of the State depends for employment, a service the interruption of which may be fraught with loss of individual health, comfort and efficiency, a service, in short, so essential to the welfare of every individual that it is perilous to leave us in any uncertainty in this respect.

Owing to the congested condition of all factories making electrical and other machinery, equipment and supplies, with the consequent delays in deliveries, some of the member companies have found it very difficult to keep pace with the increased demand for service. In some instances, I am informed, all advertising and solicitation has been suspended. I cannot help feeling that this policy, especially as it pertains to advertising, is risky. Where there is no occasion for commercial advertising it seems to me it would be a good idea to utilize newspaper space for educational work. I think, too, that sales organizations should be kept intact, as far as possible, for the reason that a sudden change of conditions, which no one can foresee, may make it desirable to have such an organization available for immediate use.

Secretary D. L. Gaskill, Greenville, in his report showing the effective work of the association during the year, said that in order to maintain the high standard it will be necessary for committees to co-operate actively.

NEW-BUSINESS CO-OPERATIONS

J. E. North, Springfield, presented the report of the committee on new-business co-operations. The committee recommended division into power and commercial sections and that in the next year the sessions of the committee be alternated between these sections. The executive committee had approved this plan.

METERS

The report of the committee on meters, A. H. Bryant, Cleveland, chairman, said that the aim is to continue the plan of the last year and broaden the scope of the committee meetings. Representatives of manufacturers take part in the afternoon sessions. A broader vision of their responsibilities and stronger bonds of co-operation are desired for the members. During the new year the committee will consider economy and greater efficiency.

ILLUMINATION COMMITTEE

S. E. Doane, Cleveland, reported for the illumination committee that the report on street-lighting specifications had been made to the executive committee. Mr. Doane said that nothing was more clear to him than that a committee gained by continuity of policy. He urged the policy of putting new men on committees, but of continuing some of the old members so that the work should be benefited by continuity of ideas.

Mr. Doane spoke of the development of a foot-candle meter, which will be of considerable value in illumination, and of the incandescent lamp for moving-picture theaters. The new lamp will supplant 75 per cent of the arc lamps now used for this purpose and will use

not over one-half of the energy of the arc lamp. The committee also considered floodlighting, said Mr. Doane, including the misuse of floodlighting. The State Commission on Industrial Lighting, of which Prof. F. C. Caldwell is chairman and Mr. Doane a member, proposes to establish minimum standards of light for industrial installations.

President Bechstein said that the establishment of new lighting standards for factories should receive the attention of the committee on new-business co-operations.

STATION OPERATING TROUBLES

Henry B. Dates, Cleveland, chairman, presented the report of the station operating committee. With the developments during the year caused by the severe industrial conditions, labor troubles and the coal situation, discussions at the committee meetings tended decidedly toward: (1) economies that can be effected in power stations; (2) handling and education of power-house labor; (3) introduction into the boiler room of such instruments as would assist in determining what are the economical points of operating boilers and how to maintain those points.

Among the leading points in the report are:

It is appreciated as never before that in the power house are possible savings of a magnitude unapproachable in other departments.

The matter of the education and training of power-house forces should receive great attention from the State and national associations.

"Results departments" are proving effective in determining sources of inefficiency and working out the improvements necessary.

TRANSMISSION AND DISTRIBUTION

The report of the transmission and distribution committee was presented by M. H. Wagner, chairman, Dayton. It called attention to the fact that the greater activities of the day demand a greater economy which leads to the generation of power at the mouth of the coal mine and the transmission of electrical energy to the center of activity, thereby following the methods employed in the development of water power. In the past year Ohio has added a steel tower transmission line of 110,000 volts which transmits energy from the generating station located at the mouth of a coal mine to various industrial centers. This has been a mark of progress in the activities in Ohio in the art of transmission of energy. Still greater development will be accomplished in the future.

The committee on standardization of voltages reported through S. E. Doane, chairman. An abstract is published on page 165 of this issue.

NEW OFFICERS

In reporting to the convention the nominating committee named President Bechstein for another year. Mr. Bechstein expressed his appreciation of the honor, but declined to accept the office again, holding that in such an association rotation in office should prevail. The following were elected: President, O. H. Hutchings, Dayton; vice-president, I. L. Oppenheimer, Pomeroy; secretary and treasurer, D. L. Gaskill, Greenville. The executive committee will be composed as follows: Robert Lindsay, F. H. Golding, C. H. Howell and E. A. Bechstein.

LOW ENERGY RATE IS ASKED IN CALIFORNIA

Prospective Consumer Wants Three Power Companies to Make Price of $15 per Horsepower-Year

The California Railroad Commission has instituted on its own motion an investigation into rates, rules and practices of the Great Western Power Company, the Sierra & San Francisco Power Company and the Pacific Gas & Electric Company as applied to the proposed plant of the Pacific Electro Metals Company. The last-named company was organized recently to build and operate a five-hundred-thousand-dollar plant for reducing and refining metals on San Francisco Bay. Complaint was made to the commission that when the power companies were asked for rates on 9380 hp. two companies quoted $36 per horsepower-year and one $40 per horsepower-year. The Pacific Electro Metals Company asserts that a rate of $15 is sufficient for this class of business.

In answering the complaint the power companies asserted that the commission has no jurisdiction to hear the proceedings because they are not signed by the proper governmental authorities or by twenty-five prospective purchasers of electricity as required by the public utilities act. The Pacific Electro company contends that it cannot secure signatures of the governmental authorities in the county where it intends to locate its plant because it is unable to decide upon the location until the commission establishes reasonable rates for the electricity it requires, and further that there are not twenty-five prospective consumers who will require electricity in the same quantity.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS

Annual Convention Will Be Held at Niagara Falls Sept. 11 to 14—Exhibitors Will Be Given Space Without Cost

The International Association of Municipal Electricians has decided to hold its annual convention at Niagara Falls from Sept. 11 to 14. President Robert J. Gaskill, Fort Wayne, Ind., has announced the following committees:

Committee on Exhibits—W. H. Flandreau, Mount Vernon, N. Y.; Charles S. Downs, Altoona, Pa.; Jacob Grimm, Buffalo, N. Y.; W. J. Lalonde, Ottawa, Canada.

Committee on Publicity—Clarence R. George, Houston, Tex.; Dr. Charles P. Steinmetz, Schenectady, N. Y.; Robert Moran, Memphis, Tenn.; William S. Boyd, Chicago.

Committee on Licensing Electricians—John Thomas, Scranton, Pa.; Frank K. Shinnin, Atlantic City, N. J.; F. S. Vincent, Grand Rapids, Mich.; R. C. Turner, Atlanta, Ga.; William Crane, Erie, Pa.

Representative to National Fire Protection Association—John Berry, Indianapolis, Ind.

The committee of arrangements and the committee on exhibits have made it possible this year for all exhibitors to acquire space without cost, the only requirement being that such exhibitor shall become an associate member of the association.

Any one wishing to exhibit this year may get full information from members of the exhibit committee, President Gaskill or M. J. Donohue, chairman committee of arrangements, Niagara Falls, N. Y.

CONSOLIDATE AND CO-ORDINATE PENNSYLVANIA POWER PLANTS

Lehigh Power Securities Corporation Acquires Lehigh Valley Properties—Large Additional Investment to Develop the Business

The Electric Bond & Share Company of New York and Edward B. Smith & Company, Brown Brothers & Company and Henry & West of Philadelphia are about ready to carry through an important electric power

TERRITORY OF THE LEHIGH POWER SYSTEM

project in eastern Pennsylvania. The Lehigh Navigation Electric Company, the Lehigh Valley Transit Company and the Northern Central Company properties will be taken over by a new company to be called the Lehigh Power Securities Corporation.

The financial plan provides for a present issue of $20,000,000 of ten-year 6 per cent notes to be offered to the public at 95 and interest with a 40 per cent stock bonus. The financial plan looks forward to large additional investment to develop the business properly. It is not intended to extend the present system much while construction costs are abnormally high as they now are, or until it is possible to get prompt deliveries of electric machinery, but it is known that existing power plants can be tied together and co-ordinated so as to enable them to perform much greater and more efficient service.

The management of the new corporation will be in charge of the Electric Bond & Share Company, of which Sidney Z. Mitchell is president. All the common stock of the Electric Bond & Share Company is owned by the General Electric Company.

UNUSUAL POWER AND LIGHTING OPPORTUNITY

While the Lehigh Coal & Navigation Company sells its generating station and distributing system, it will own an important interest in the new corporation. There is an unusual opportunity for development of power and lighting business in the coal regions and at Bethlehem and the other Lehigh Valley industrial sections served by the present plants. This combined with the adjoining regions provides an extensive market for energy.

There will be an immediate enlargement of the Lehigh Navigation plants at Hauto and Harwood, which together will have an aggregate development of 70,000 kw. These are to be tied in with the Lehigh Valley Transit plant now being enlarged to 30,000 kw., and other plants will be constructed as required to meet the demands of the public. They will be located at points close to Lehigh Navigation coal, where water is available for condensing purposes.

CHICAGO MAKES ADDITIONS TO ITS PARK LIGHTING SYSTEM

Addition of 8.75 Miles of Parkway and Boulevard Illumination in Chicago's South Side Parks Notable for Unique Lanterns

Three additions to the extensive boulevard and park lighting systems of Chicago are now being made that will cover 8.75 miles (14 km.) and cost according to estimates about $116,000. On the 5 miles (8 km.) of Michigan Avenue which will be relighted, 320 double lanterns on cast-iron standards served from five 1-mile (1.61-km.) circuits will be erected. One of these standards is shown in the accompanying illustration. The plan of arrangement is to have four standards on the corners of each street intersection. Between the intersections the lamps will be staggered on both sides of the streets so that it will be possible later to add to the system by placing intermediate lamps opposite those already installed.

NEW CHICAGO STANDARD

The energy-supply equipment originally installed will be adequate to carry this additional load without changes. The typical block contains four lamps between intersections. In so far as possible the present 5000-volt cable will be used since it has been determined that the rubber insulation, although some of it has been in service since the World's Fair, is as good as new. It is said that the lighting standards, which cost $40 cash when the contracts were let two years ago, could not be duplicated now for $80 each. The standards which these units will replace are of the old World's Fair type. The lay-out and installation of this system are being carried out under the direction of W. I. Bell, mechanical and electrical engineer, and Frank Brueggeman, assistant mechanical and electrical engineer, for the South Park commissioners.

Bibliography of Submarines

A bibliography of the literature of submarines, mines and torpedoes has been compiled by David B. Rushmore, engineer power and mining department General Electric Company, assisted by William H. Lanman and Eric A. Lof. It was compiled with the hope that it might be of some assistance to those working on the problem of submarine detection and destruction. This bibliography will appear in the August *General Electric Review*, but is also published separately.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Increased Rates in Philippines.—The Philippine Islands Public Utility Commission has allowed an increase in steamship rates to prevent operation at a loss. It recognizes the high prices of materials for repairs and operation because of the European war, although the increase will work a hardship upon patrons by making living more expensive for them. The commission says: "It cannot be doubted that the permission of this increase in the rates will contribute to make living more expensive in the towns on the lines concerned, as alleged by the protestants; but this is the necessary result of the abnormal and difficult economical conditions that now prevail in this country, the burden of which should be equitably borne by all."

Distribution of Costs.—The Maine Public Utilities Commission, in a case affecting the Portland Water District, says: "Unless there is some controlling reason to the contrary, every consumer of the product of a public utility ought to pay his fair share of the entire cost of the utility. There is a constant effort to exempt or favor special classes for reasons which, in themselves, seem sufficient. Sometimes they are charitable; sometimes they are inspired by a belief that they promote the public good. These, in frequent instances, are justifiable. But, in the end, every favor granted to one class is paid for, not by the utility, but by the other consumers, either by immediate increases or a postponement of the day when the other consumers may get a reduction. The statute fixes the total revenue which the Portland water district shall receive. If the recipients of one class of service do not pay, others must."

Criticism of Corporation's Methods.—In denying the petition of the Cayuga Power Corporation for permission to construct a transmission system for furnishing electricity in certain parts of Tompkins County, the New York State Public Service Commission, Second District, with the exception of Commissioner Emmet, voices its opposition to allowing the Cayuga Corporation to exercise its franchises on the ground of the methods employed by that corporation in obtaining its charter, and also censors it for going ahead with its construction work without first obtaining the permission of the Public Service Commission at Albany as required by law. The commission charges that this last act of the Cayuga Corporation is a flagrant violation of law, which, it says, should not be tolerated. It developed at the hearing recently held in the matter that the corporation's excuse for this action was that the scarcity of labor made it vital for the interests of the Cayuga Corporation to construct its system while labor was available. This excuse, however, is not regarded as being sufficient. In regard to the charter of incorporation it appears, the commission charges, that an attempt may have been made to evade the jurisdiction of the commission until a time when the corporation had carried out all of the necessary preliminaries free from any restraint or, in other words, the sudden transformation of a business corporation into a transportation corporation. For instance, when the application was brought before the commission the Cayuga Corporation was already a full-fledged corporation with capital stock and bonds issued and outstanding over which no supervision had been exercised by the commission in spite of the claim of the Cayuga Corporation that it was created under the provisions of the transportation corporation act. For this reason, acting upon the belief that the Cayuga Power Corporation is not legally incorporated to carry on the business which it is seeking to do, the commission has denied the application. The Cayuga Power Corporation sought approval to exercise franchises granted by the towns of Lansing, Dryden and Groton and the villages of Freeville and Dryden, all situated in Tompkins County. These franchises provided that the Cayuga Corporation shall construct an electric plant and furnish service in these municipalities. The commission does not dispute that such service is needed in these municipalities and refuses to issue a certificate of necessity solely on the grounds mentioned above. The sole appearance against the granting of the certificate of necessity to the Cayuga Corporation was made by the Ithaca Traction Corporation. This company claimed that should the Cayuga Corporation be permitted to exercise its franchises, a serious loss might be inflicted upon the traction corporation. The chief customer of the Ithaca Traction Corporation, which also engages in the business of selling power, is the Ithaca Gas & Electric Corporation. The commission is of the belief that it does not come within its duty to protect the interests of a corporation far in excess of the legitimate requirements of its business as in the present case. In addition, it maintains that there is no indication that the commission would permit another corporation to enter the city of Ithaca and compete with the traction corporation. The Cayuga Power Corporation, it is stated, did not seek to engage in the street railway business, while, on the other hand, the Ithaca Traction Corporation has no right to carry on an electric light and power business in the municipalities which granted franchises to the Cayuga Corporation. Commissioner Emmet, who dissents from the conclusions reached by his colleagues, is of the opinion that the advanced development of the Cayuga Corporation would justify the commission in granting it authority to exercise the franchises that belong to it.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Technical Terms in Contracts.—Technical terms in a contract may be given a non-technical meaning, relied upon by one party, where the other party had reason to suppose the former so understood them. An injunction may be granted to prevent a public service corporation from wrongfully cutting off a supply of electricity which it is under contract to furnish, the Supreme Court of Nebraska held in the case of Richey vs. Omaha & Lincoln Railway & Light Company.

Liability for Injuries to Experienced Employee.—Where the overseer of lines of a telephone company engaged in dismantling a line at the company's direction was injured when a telephone pole which he had climbed broke off at the ground because it was rotten, the telephone company was not liable for the injuries, since the employee was engaged in dismantling work, was experienced and in full charge, and determined for himself whether poles were sound or unsound, it was held by the Appellate Court of Indiana (116 N. E. 600).

Extension of Contract by Agreement.—The contract of an electric company for lighting defendant village's streets was not extended, the Appellate Division of the Supreme Court of New York held (165 N. Y. S. 247), in Northern Westchester Lighting Company vs. President and Trustees of Village of Ossining, by agreement, by the company, on the last day of the existing contract, after unsuccessful negotiations for a new contract, resulting in a resolution of the village board that the corporation's counsel apply to the Public Service Commission to adjust cost of lighting, writing the village president that till the village makes further agreement the company will expect it to pay the rate provided in the existing contract, and the letter remaining unanswered, or by bills for lighting thereafter presented being audited for the first four months. Under provision of the electric light company's franchise that it shall annually supply the village free with $2,000 worth of light at such places as the village board may appoint, such appointment is a condition precedent. The purpose—light of a certain illuminating power—of provision of contract between electric lighting company and village that as to each incandescent lamp the company would furnish a current of 100 watts (a watt being the unit of power) was accomplished by a substitution of a subsequently invented lamp giving such light with a less number of watts of power than was required in the case of the lamp previously used.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Limitation of Imports of Electrical Equipment.—United States Consul General George H. Murphy, Cape Town, South Africa, says that the Cape Town Chamber of Commerce has received the following letter from the Secretary for Mines and Industries: "In view of the position in which the electrical industry of the United Kingdom is placed in regard to its export trade, owing to restrictions of manufacture and exportation involved by the war, it is desired to call the attention of your chamber to the desirability of deferring as far as possible the calling for tenders for electrical machinery and equipment for public contracts until the conclusion of hostilities."

Electrification of Swiss Federal Railways.—William P. Kent, United States Consul at Berne, sends the following: "Electrification of the Swiss federal railways has now emerged as a very practical economic question. The government has created a special department, attached to the direction of the Swiss Federal Railways. This department announces that it is prepared to consider proposals for sale and delivery of such electrical material as may be necessary for equipment in connection with this work, and that bids will be received from all countries. A statement by the management shows that large orders for copper wire already have been placed with certain firms in the United States."

The Successful Electric Vehicle.—A. Jackson Marshall, secretary Electrical Vehicle Section, N. E. L. A., writes: "If we were to eliminate from the gasoline car its ignition, the internal reciprocating combustion engine, its carburetor, its gears, the radiator and water jackets, the gasoline tank, etc., and leave its electric starting apparatus, we should have a small complete edition of virtually the entire propulsion equipment of an electric vehicle. Such process of elimination will give some practical idea of the remarkable simplicity of the modern electric vehicle and will account for its ease of operation and the long life insured by the absence of thousands of parts which wear and demand constant attention. When the well-nigh irreducible simplicity of the modern electric vehicle is associated with the highly developed storage battery—a distinct commercial success—which, by the employment of somewhat recently developed methods, may be speedily charged, we have a motor vehicle which for economy and simplicity of operation, dependability, long life, cleanliness and elegance of appointment represents the utmost in vehicular transportation."

Standard of Vehicle Service.—A booklet, "Standard of Service and Care in the Operation of Electric Vehicles," has been issued by the committee on standards of the Chicago Electric Vehicle Section of the National Electric Light Association, Chicago. It was published by courtesy of the Commonwealth Edison Company. It contains instructions on care and rating of storage batteries, a sample form for keeping a record of operation, and general recommendations for public garages. It also discusses central station service for electric vehicle users, shows how to estimate cost of electric power, and gives directions for reading meters and maps showing electric vehicle charging stations in Chicago and vicinity. An explanation of Chicago's parking service and a road map of Chicago and vicinity are also given. The booklet is being distributed to association members and interested car owners.

Helping to Settle the Coal Problem.—A letter from Blaine Gavett, secretary American Public Utilities Company, says: "For the last six months or more our company and subsidiaries have been doing everything possible to co-operate with the Federal Trade Commission, the coal committee representing the public utilities in the Middle Western States and local boards of trade and chambers of commerce with the view of helping increase the coal supply and induce mine owners to be satisfied with a reasonable profit. We believe the car supply is of great importance in this connection. We know that a vast amount of coal is available right now if cars can be obtained in which to move it. A practice of urging every one to unload cars with least possible delay and keeping after railroad agents and yardmasters to move empty cars promptly after unloading would be a great help in this direction. We should appreciate an effort on your part to increase activities along these line."

Purchase of Energy in Juneau, Alaska.—The Common Council of Juneau, Alaska, has voted to enter into a contract with the Alaska Treadwell, Alaska United and Alaska Mexican Gold Mining companies for the purchase of electrical energy to supply the city. The energy will be resold to the inhabitants by the city at approximately 50 per cent less than is now being paid. The contract accepted at the meeting contains a proviso that if the city does not elect to install its own distributing system it may arrange with the Alaska Light & Power Company, now furnishing the energy, to use its distributing equipment, including lines. The three companies are to sell to the city of Juneau for ten years all the energy required for lighting, heating and power purposes. The municipality is to provide a distributing system. The rate of 2 cents per kilowatt-hour shall prevail except during such periods as the price may be advanced to 3 cents, under certain conditions, for certain months, when the cost of operating by the companies is increased. The city must not sell energy outside of corporate limits.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

Rochester Section, A. I. E. E.—J. W. Morrison was elected secretary of the Rochester Section of the A. I. E. E. recently.

Fort Wayne Section, A. I. E. E.—At a recent meeting of the Fort Wayne Section of the A. I. E. E., R. B. Roberts was elected secretary.

Electrical Contractors' Association of New Jersey.—The annual midyear convention of the Electrical Contractors' Association of New Jersey was held at Pleasure Bay, July 14, with a large attendance from different sections of the State. A business session was followed by addresses and talks.

American Association of Engineers.—At the annual meeting of the American Association of Engineers July 13 the following officers were unanimously elected: President, Edmund T. Perkins, consulting engineer and president of the Edmund T. Perkins Engineering Company, Chicago; first vice-president, W. H. Finley, chief engineer of the Chicago & Northwestern Railroad; second vice-president, Isham Randolph, consulting engineer and president of Isham Randolph & Company, Chicago. The main provision of the new constitution is the enlargement of the number of board of directors from five to fifteen members, but the board may appoint five members to manage actively the affairs of the association. A clause to include associates is provided in the constitution. This membership pertains to men who are not necessarily engineers but interested in engineering affairs. They may be admitted up to 10 per cent of the certified membership.

California Association of Electrical Contractors and Dealers.—The eighth annual convention of the California Association of Electrical Contractors and Dealers was held at Santa Cruz, Cal., July 11 to 14. Among the papers that received particular attention were "Diversified Problems of Electrical Contracting," by C. F. Butte; "Retailing and Merchandising," by L. Levy; "Building a Newspaper Ad," by H. A. Lemmon, and "Business Phases of Electrical Contracting and Dealing," by H. C. Reid. The convention was notable for the attendance of representatives of all phases of the electrical industry, including manufacturers, jobbers, dealers, contractors, central station companies, electrical inspectors and the Board of Fire Underwriters. The spirit of co-operation that was manifest in the several meetings was taken as a most favorable sign. The registration was about 275. H. C. Reid of the Pacific Fire Extinguisher Company, San Francisco, was elected president for the ensuing year.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

George H. Harries, for years prominent as a public utility executive and now in command of the Nebraska National Guard at Fort Crook, has been commissioned brigadier general by Governor Neville, and will be recommended by the War Department for similar rank in the regular army. General Harries since 1912 has been a vice-president of H. M. Byllesby & Company. He is also president of the Louisville Gas & Electric Company, the Omaha Electric Light & Power Company, the Arkansas Valley Railway, Light & Power Company, and an officer in a number of other large utility organizations. From 1900 to 1911 he was vice-president and general manager of the Washington (D. C.) Traction & Electric Company. For several months General Harries has been engaged in work for the Council of National Defense and War Department. Born in Wales in 1860, the son of an officer in the British army, General Harries came

GEORGE H. HARRIES

to the United States when a boy and served as a scout under Generals Miles and Crook in frontier wars with the Indians. He was a member of the government's commission settling the grievances of the Sioux Indians in 1891. In 1888 he went to Washington as a newspaper reporter, later becoming president of the Metropolitan Railroad Company in that city. From 1897 to 1917 General Harries as brigadier general was in command of the military and naval forces of the District of Columbia, retiring as major-general May 26 of the latter year. During the Spanish-American War he served as colonel of the First District of Columbia Infantry, United States Volunteers, participating in the siege of Santiago, Cuba. He has been a member of the War Department board on the promotion of rifle practice since organization. His utility association activities have been very wide, he having been president of the Association of Edison Illuminating Companies, president of the American Street Railway Association and an officer and member of the public policy committee of the National Electric Light Association. He is a past national commander of the Order of Indian Wars, composed of army officers.

F. D. Nims, formerly engineer and assistant general manager of the Olympia Power Company of Port Angeles, Wash., has become connected with the Northwest Electric & Water Works of Montesano, Wash., with offices in Seattle. This property recently was acquired by Warner Marshall of Boston, Mass.

Gresham Thomas, formerly of the Georgia Railway & Power Company, Atlanta, Ga., is now purchasing agent of the Mill Power Supply Company. Seventeen years ago Mr. Thomas began his work with Ford, Bacon & Davis, engineers in charge of building the railway system in Atlanta and changing overhead wires in the downtown district to the present underground system. He continued with the railway and power company in various departments up to the time of his resignation to take up his new work. Mr. Thomas has charge of purchases, through the Mill Power Supply Company, for the Southern Power Company, the Southern Public Utilities Company and allied companies, these having no purchasing department but conducting their buying through a separate company.

Fred Allison, who was recently elected a fellow in the American Institute of Electrical Engineers, is electrical engineer for the Ford Motor Company at Detroit, Mich. Mr. Allison, who was born in Lapeer, Mich., in 1881, attended the Detroit schools and before entering college spent a few years in gaining practical experience. He was employed by the Michigan Auxiliary Fire Alarm Company for a period of two years or more on apparatus design. Having gained a knowledge of storage-battery operation, he entered the employ of the Detroit Edison Company in this work. After having installed and supervised the installation of different storage-battery plants and other power apparatus he became connected with the Electric Storage Battery Company at Philadelphia, where he was engaged in research work during the early experimental stages of the "Exide" type of battery used in electric vehicle construction. He next was employed by the Commonwealth Edison Company, Chicago, to design controlling apparatus for the special vehicle which the company was about to use in its service. Upon completion of this work Mr. Allison promoted and established what was believed to be the first and at that time the largest vehicle garage in the United States, known as the Automobile Equipment & Maintenance Company of Chicago. Mr. Allison is now associated with the Ford Motor Company, serving in the capacity of superintendent of power and chief electrical engineer of all power equipment of the Ford Motor organization throughout the world. During his connection with this company he has designed and installed power plants aggregating a total of 100,000 kw. or more. Some of this equipment is in the main plant of the Ford Motor Company, which has the largest direct-current installation in the world. Mr. Allison has designed many new features of plant operation, besides originating or co-operating with others in the origination of numerous devices. Among these are the light-weight electric vehicle which Alexander Churchward and he were largely instrumental in producing, electric welding and tempering devices, a special direct-current motor design, combination 20-hp. to 40-hp. motor-operated starters now being produced by the Westinghouse company, numerous automatic-control devices and recording devices, electric furnaces of high temperature, and also graphicizing

FRED ALLISON

development, electric cleansing of producer gas by ionization, many electrolytic processes in steel tempering and many safety devices. He was concerned also with the advancement of magneto and ignition design. Mr. Allison has contributed considerably to electrical literature.

Obituary

Prof. Kristian Birkeland, whose name is well known because of his work with Dr. S. Eyde on atmospheric nitrogen fixation through the Birkeland-Eyde process, died in Tokyo, Japan, on June 18. Professor Birkeland was born in December, 1867. He received his education at the University of Christiania, Norway. In 1898 he was appointed professor of physics at this university. In 1903 he began his study of nitrogen production from the air and together with Dr. Eyde developed the Birkeland-Eyde process, which is now largely used for producing nitrogen in Norway. Professor Birkeland was a frequent contributor to physical literature, and was an honorary member of several societies whose achievements have an international reputation.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

FAN MANUFACTURERS ARE LOOKING AHEAD TO 1918

Conditions in Market for Raw Materials and for Labor Such that It Is Doubtful if Much Development Work Will Be Undertaken

So far as can be learned the supply of fans in the wholesale market has been completely wiped out. Retail distributers, having cleaned their shelves last season, were eager purchasers this year. The situation which now confronts the industry is next year's market.

Up to the present week fans have not moved from retail stock very fast. In fact, in the greater part of the country the sales so far this year are below normal. Therefore, unless more seasonable weather comes along shortly, retailers will probably carry over large stocks of fans. In this case, of course, the manufacturers would not make up such a large supply as they did this year.

However, the raw materials market is in such a condition that the manufacturer feels he wants to place his orders as soon as possible. Some manufacturers have done so already, but not all of them. The extent to which fans find their way into the hands of the public in the next two or three weeks will be the determining factor in many instances.

It is doubtful if the 1918 fan will be any different from the 1917 model. Labor is high and scarce and will be more so, while the condition of the raw-materials market has already been touched upon. For these reasons it is very doubtful if much development work will be done this year. There may be a tendency to standardize on types by cutting down on the number of different models, but it is not likely that there will be more than one or two new models on the market next year.

GUIDING PURCHASES OF CONTRACTORS AND DEALERS

By Selling Balanced Stock, Supply Jobbers May Lower Credit Liability of This Class of the Trade

Small contractors and dealers, it has been pointed out time and time again, constitute the greatest credit risk to electrical supply jobbers. Efforts are being made by the jobbers to cut down the risk from this class of buyers. It was thought for a while that the trade acceptance plan was the solution, but it was found to have its limits. Trade acceptances, it has been found, are all right so far as they go, but they do not prevent the contractor from failing.

Something else must be found, it is felt, not so much as a substitute for the trade acceptance plan where used, but as another cog in the credit machinery. As is well known, a contractor or dealer wishing to branch out for himself goes to the jobber and orders a certain stock. His purchases are probably limited to his ability to pay. The point is, however, that he picks out what he will buy and the quantity within the limit of his pocketbook.

The chances are that he has had only a limited experience in buying stock or in estimating the amount of each part of the stock required. In fact, it is very doubtful if a majority of the smaller contractors and dealers actually in business have a very definite idea of what constitutes a balanced stock. It is probably more than likely that they buy what the salesman sells them.

It becomes evident, therefore, why there is so high a mortality among contractors and dealers. Aside from the fact that a knowledge of costs and merchandising methods is so often lacking, the most serious trouble, if the quick failures are carefully analyzed, will probably be found to be too much slow-moving stock. The contractor or dealer might be a thoroughly competent and industrious person, but if he has invested heavily for him in slow-moving stock, he not only loses the return which he might have on a more productive investment, but he also loses the use of capital which might have permitted an expansion in a more productive direction.

The loss of this latter business of course falls on the jobber as well. Furthermore, should the contractor fail the jobber loses again. He may have been paid up, but he has lost a customer. It is apparent, therefore, that the jobber must take the contractor and dealer under his wing, and when one of this class wishes to open a store must guide his purchases in such a way as to give to the new business a stock of the required value, balanced in all directions.

The idea itself is not new. One of the largest hardware jobbers in the country has a plan of this nature in use. Standard stocks have been made up corresponding to certain investments. A person with $500 to spend gets stock A, $1,000 stock B, $2,000 stock C, etc. Other trades have worked in much the same direction, although on plans generally narrower in scope.

Thus, if a dealer wishes to buy flashlamps, he can get a standard stock for say $5 a month, one for $10, etc. The same is true for certain kinds of incandescent lamps and also for certain of the cheaper lighting fixtures. In other words, it has been found that certain sizes and articles move faster than others in a certan ratio. Therefore it is reasonable to assume that the best stock would be that in which these ratios were closely followed.

THE WEEK IN TRADE

GENERAL good business marked last week. Deliveries are getting better. There was little or no price fluctuation, although some advances are expected shortly. Labor conditions around Chicago and the Northwest are registering their effect on the market. Collections generally seem good.

NEW YORK

While normally this season of the year is rather slow and quiet, buying activities generally show but little abatement from previous months. Where the demand is dependent entirely upon building operations, the volume of business has shown a falling off. Wire manufacturers report decreased sales in the neighborhood of 20 per cent, with the bulk of the buying from industrial plants, excepting, of course, the orders from the government. Fixture sales, which are dependent almost entirely upon non-industrial building operations, have dropped away below normal. Lamp sales are also low.

There were no evidences of any price changes during the week. After two years of continuous change in price the present rather stable condition of prices is very noticeable. To a large extent this stability is owing to the uncertainty regarding the action the government is going to take on the price question.

CONDUIT.—Although there have been many rumors that higher prices would come shortly, the prices remain unchanged. Stocks generally are low, and deliveries remain unchanged, with no immediate prospect of betterment. The demand keeps up in volume with no change in channels of distribution.

FIXTURES.—Business is virtually at a standstill. There is so little building of apartment houses, hotels, residences, etc., that the volume of business has fallen away below normal. Both the expensive and the inexpensive types are affected. Prices show no change, and fixture houses state that there is no immediate prospect of any change.

GLASSWARE.—A sharp advance in price of glassware is predicted by manufacturers. Prices for the season which is about to open, it is thought, will be anywhere from 25 per cent to 100 per cent higher than last year. Demands were made this week by workmen for higher wages. Practically every line of glassware is affected.

WASHING MACHINES.—Owing to the condition of the market for raw materials, particularly galvanized and copper sheets, it is anticipated by the trade that prices will advance during the next few days. An advance of 5 per cent is expected on galvanized washers and 10 per cent on copper washers.

HEATING APPLIANCES.—The sale of flatirons holds up well. Department stores which a few weeks ago had curtailed buying indefinitely are now again purchasing irons and toasters freely.

FANS.—Owing to more seasonable weather the retail movement of fans was better this past week than in any previous week. Wholesale distributers are sold out, but the trade is having difficulty in disposing of its stock to the public. Sales so far this year are below normal. A few really scorching days would, of course, do much to dispose of the fans on hand, but otherwise a large carry-over is expected. A note of warning was sounded by one large distributer. He pointed out the uncertainties of the market for materials and the consequent uncertainties of the 1918 fan supply. For that reason he was of the opinion that retailers would be making a mistake to dispose of stocks on hand at sacrifice prices in order to clean up the shelves.

RANGES.—Electric range sales have been very large this year in the New York territory outside the metropolitan limits. Within New York City high rates have a deterrent effect on range sales. In a large part of New Jersey the same condition is found. Where low rates are in force the sale has been tremendous. One distributer has so far this year booked 172 per cent more electric range business than during the first seven months of 1916. Ranges are selling very well in small towns.

WIRE AND CABLE.—Stocks of standard sizes rubber-covered wire are in good shape. In fact, they were sufficient recently to take care of a large government cantonment order without putting any additional burden on the factories. Deliveries are now being made at from six to eight weeks on large orders. There is no stock on hand of weather-proof wire. The greatest delay is experienced in underground cable, which is never stocked. Some factories are so far behind now in deliveries that they are accepting no new business for the remainder of the current year. Demand has fallen off somewhat. Most of the domestic business, excluding government orders, now comes from industrial plants. For residence, church, apartment, hotel, etc., construction there is very little demand for wire. Standard small-size rubber-covered wire demand is very small, therefore, and manufacturers are not receiving large orders except from jobbers. There is, however, a very heavy demand for power cable. The majority of manufacturers are quoting on a 37-cent base, although some are quoting as high as 40 cents.

BELLS AND GONGS.—The demand is very good both in the cheaper and in the more expensive lines. Deliveries are still behind. Prices remain unchanged, and although there are no rumors of advances in the near future it has been intimated that higher prices may be expected.

LAMPS.—Sales to the trade are keeping up with past summers. There has been a very marked deferment in buying by central stations, but this slump will be made up before long. Just at present the government is buying practically all of the available miniature lamp output. Deliveries have become much better and manufacturers are again putting lamps into stock. Local stocks are in excellent shape. Some jobbers now have more than a normal supply on hand.

CHICAGO

There has been little change in the general business situation in the Chicago territory the past week. Warm weather in the last few days of the week brought optimism to the retail fan sellers, although not a great deal of business developed owing to the lateness of the season. The electricians' strike is still in progress and seems to promise to be a long-drawn-out affair. The employers' association is backing the contractors. An inquiry was recently made by a large Ohio industrial plant for 10,000 kva. of synchronous condensers in six units for power-factor correction within the plant. Copper prices were weaker, and prices of porcelain were withdrawn awaiting announcement of a new advance.

ELECTRIC RANGES. — Practically all of the jobbing houses at Kansas City are seriously considering the range question. The city is blessed with a favorable electric situation and at the same time finds the gas situation critical. Jobbers are planning campaigns on these devices.

SECOND-HAND MACHINERY. — A large second-hand machinery house in Chicago reports that in June it sold practically every motor rated at between 2 hp. and 100 hp. which it had listed for sale. This means that at present the concern is turning over its capital every thirty days.

SYNCHRONOUS MACHINERY.—The Electric Machinery Company of Minneapolis has instituted what is called a progressive bulletin service. This is designed to assist consulting engineers and other buyers and specifiers of machinery in practical solutions of power-factor correction problems.

HEATING DEVICES.—Some of the larger heating-device companies are figuring on supplying to the government heating equipment which may be used by the soldiers in trenches.

BOSTON

Jobbers are experiencing a moderate reduction in the volume of business, due in part to seasonal conditions and apparently affected somewhat by high prices and a feeling of uncertainty as to the future. It is not believed that there will be any serious slump in business as a result of the draft, although in some quarters this is looked upon as a disturbing influence. Readjustments in manufacturing and commerce are continually taking place as the war advances. Credits and collections are reported as poorer this week, and one prominent jobber states that never in his relations with electrical contractors were collections in such bad shape. A healthy demand for appliances continues to be felt, one large central station having sold 2700 flatirons in the last month. The gross business of this company in appliances totaled $238,000 for the year ended July 1, compared with $117,000 the previous year. Work is progressing with great speed at the Ayer (Mass.) cantonment, officially to be known as Camp Devens. About 5000 men are now employed at this point, where 37,800 troops will be quartered, and the electrical requirements include about 2,000,000 ft. of wire, 3000 kva. in transformers, 30,000 lamps and 1000 poles. A telephone exchange building, 84 ft. long and 20 ft. wide, is to be opened this week and plans are completed for the immediate construction of an 8-mile, two-circuit steel tower line which will deliver energy at 66,000 volts to the cantonment from the New England Power Company's system.

Prices show little change compared with last week, and advances are not anticipated in many lines at present, though there is some expectation of further increases in floodlights and sockets.

LAMPS.—Prices remain as usual on domestic lamps. Deliveries on common sizes of tungsten units continue to improve and immediate shipments can now be made on many of these. One large manufacturer has a stock of more than 1,000,000 lamps in his Boston warehouse.

APPLIANCES.—The volume of trade is well maintained. Fans began to move very rapidly the first of the week on account of the hot wave, with the prospect that stocks would in many cases be exhausted by the end of the season. The vacuum cleaner trade shows a slight falling off. Washing machines are enjoying a steady sale.

MOTORS.—Motors are very active, both in alternating-current and direct-current types. In general deliveries are not so good except where manufacturers' stocks permit prompt shipment. The transportation problem has been solved for motors of one prominent make entering New England by marine shipments from the New York City district. Given the motors required, delivery is a matter of two or three days only.

TRANSFORMERS.—Business is somewhat lower in volume than heretofore, the demand for equipment for residential service being less and the market for industrial transformers being pretty well sold out. Even for military use, some difficulty has been experienced in obtaining transformers of large capacity within desired time limits.

SMALL GENERATORS.—Long deliveries, at least four to six months, discourage buying for isolated-plant service.

ARC LAMPS.—The demand is about normal for this season. There is no certainty that existing prices represent the maximum in this department.

FLOODLAMPS.—Business is still above normal, although the volume of trade in these equipments is somewhat less than immediately after the entrance of the United States into the war. Well-informed opinion is that prices may rise in the future, though no immediate schedules of increase are in hand.

WIRE.—A fairly steady demand is to be seen, with prices holding at current bases. No serious advance is expected in the general wire market at this time.

IRON CONDUIT.—Jobbing authorities report conditions as very bad in this department, with quotations demoralized.

LABOR.—The scarcity of labor, already serious in many localities, will be increased by the draft. Jobbing interests are looking for competent sales material in some instances. As a straw showing the direction of the wind, women bootblacks have begun work in Boston, and there is no question that in the utility and commercial branches of the electrical industry women will be called upon to an increasing degree as the war continues. Labor relations with electrical employers appear good at present.

ATLANTA

Specifications covering work for cantonments are rapidly reaching definite shape, permitting the trade to prepare and meet the abnormal requirements. It is reported that each camp through the local quartermaster will place orders for its quota of material in the proper quantities to be shipped as the work progresses. Approximately 300 electrical wiremen will be required for each camp to complete the interior wiring, street-lighting circuits, primary and secondary distributing systems in the proper time. While these men will be drawn mostly from the local industrial section, it is not expected that the labor situation will be very much disturbed, as wages will be about the same as now prevailing and the work will have to be completed in a comparatively short time.

The letting of large government contracts creates prosperous conditions, but exclusive of this feature general business is excellent and there is no visible indication that this condition will change materially very soon. Prices in all lines are firm with no marked advance.

Atlanta jobbers have an investment in stocks 50 per cent in excess of those carried on the same date a year ago. The contractors are not buying in large quantities. There is a slight tendency to hold up building on account of high prices and scarcity of material.

APPARATUS.—Although buyers are cognizant of the raw-material situation and shipment promises, the manufacturers are receiving numerous inquiries for large equipment and the volume of business continues strong.

CABLE.—Deliveries on varnished cambric are improving. The market for heavy power cable is good, and promises of four months are being given. Stocks of the lighter cables are in very good condition.

DRY BATTERIES.—Climatic conditions are having a considerable effect on the volume of sales. The prevailing good weather at coast ports, however, has accelerated buying for marine purposes. There has been no advance since July 1. A sufficient supply is on hand.

FANS.—The demand has slackened during the week owing to rainy weather and lower temperatures.

DOMESTIC APPLIANCES.—Fairly steady demand is shown for irons, but the market for other household appliances continues dull.

CORDS AND PORTABLES.—There are prcatically no local stocks excepting standard No. 18 cotton-covered. Shipments on all other types are long, with no prospect for early relief owing to scarcity of raw materials.

METERS.—No let-up is noticed in demand for standard sizes. Shipments on high-tension types show no improvement.

POLE AND LINE MATERIAL.—Demand for all classes of this material is very strong. One large manufacturer reports good deliveries on large order for past week. The market for porcelain products is stronger than last week, in the face of 10 per cent increase July 11. No promises are being made, however, on deliveries.

WIRE.—Stocks of smaller sizes of solid conductor, both rubber-covered and weather-proof, are in very good condition. All stocks of standard conductors are practically depleted, with no prospects of early replenishment, as deliveries are slow.

WIRING DEVICES.—Demand is excellent. Local stocks are in good shape with reasonably prompt factory shipment.

TRANSFORMERS.—The demand is increasing and deliveries are improving.

ST. LOUIS

Conditions in this territory are, on the whole, exceedingly satisfactory, although there is some complaint as to inability to obtain certain materials, notably those involving iron in their construction. The industrial demand is tremendous. The interests interviewed report sales for the six months just past greatly in excess of the sales for the corresponding period last year.

Utilities appear to be buying sparingly, and only where absolutely necessary, although the aggregate of their purchases is very large.

There are still complaints of high prices and slow deliveries, but on the whole deliveries are improving. The jobbing trade appears to be in a particularly satisfactory condition, although stocks are low.

Collections are good in spite of the fact that money is tighter than it has been. While the prices for electrical supplies in this territory are stiff, they are not, it is claimed, so high as might be expected, considering the difficulty that is encountered in obtaining stock. Considerable quantities of supplies were purchased last fall at relatively low prices, and some of the concerns which have this material in stock are disposed to sell it at prices based on its actual cost rather than on the market prices now prevailing.

WIRING SUPPLIES.—There is a stiff demand for industrial plant wiring supplies for the new plants and installations which are now under construction. On the other hand, the construction of buildings for residential and rental purposes is rather slack, due to the high cost of all labor and materials. This is particularly true of buildings which are contemplated solely as real estate investments. Promoters of a large hotel endeavored to cancel the contracts after the foundations had been made because of the high cost of all materials. The demand for knob-and-tube wiring supplies is very poor. Jobbers find some difficulty in obtaining supplies which incorporate iron in their construction. The deliveries on most brass materials are fairly good. Substantial orders for wiring supplies for the United States Army encampments at Little Rock, Ark., and Fort Riley, Kan., have been filled from stock in this territory.

WIRE AND CABLE.—While this territory has not as yet felt the effect of the recent large government orders for insulated wire, it is expected that this will be a factor in future deliveries. Some of the large jobbers now have fairly good stocks of wire, but they are constantly decreasing, and it now may be accurately stated that stocks in general are depleted.

POLE-LINE HARDWARE.—Jobbers are having more difficulty in obtaining this material from the manufacturers, and some construction has been abandoned, temporarily at least, because of the very long deliveries quoted.

WROUGHT-IRON CONDUIT.—The demand is very good, but in most cases stocks are very low. Some jobbers are asking and getting card prices for immediate delivery. Deliveries from the manufacturers are very slow.

MOTORS.—Good sales are reported. Motors of popular ratings are taken out of branch house and jobber stocks about as fast as they are received. The business for the first six months of the year has been excellent in spite of the fact that deliveries generally are very poor. There is a big demand for motors for oil pumps in the Kansas and Oklahoma fields, and many motors are being sold in Arkansas for water pumping for rice fields.

INCANDESCENT LAMPS.—Business is most excellent, showing very material increases over the corresponding period for last year. Some stocks are low, while, on the other hand, other stocks are reported as being practically up to normal. It has been predicted that it is not unlikely that the demand for lamps will be strong a few months hence, and not improbable that the stocks may be depleted because of the cantonment orders and because of the fact that so many factories are operating on twenty-four-hour shifts. The central stations have been placing very large orders.

CENTRAL STATION SUPPLIES.—One concern reports an astonishingly great demand for staples, such as watt-hour meters, distributing transformers and switching and metering equipment in general. This is assumed to be due largely, though in a measure indirectly, to industrial activity.

FAN MOTORS.—From the manufacturers' standpoint the business has been very satisfactory, but in view of the almost uniformly low night temperatures which have been recorded over the country recently in the principal fan-using centers, it would not be surprising if sales should not continue to hold up. The sales on fans in Kansas and Oklahoma have been particularly good because of the heat waves which have passed over portions of those States.

MINING EQUIPMENT.—Mining electrical equipment is in great demand, particularly that for coal mining. This condition has been created by the fact that labor is scarce.

CEDAR POLES.—There are indications that Western and Northern cedar poles will be very scarce in the immediate future. In fact, there is now a noticeable shortage of the larger poles, those 50, 55 and 60 ft. long. Last winter the producers were unable, owing to the scarcity of labor, to get sufficient men to go into the woods for cutting.

SAN FRANCISCO

Practically no changes in prices occurred during the week, and there was a notable lull in electrical trade generally. The lull is accounted for partly by the large advance orders recently placed by firms engaged in construction or extension of plants and partly by a decrease in building activity. Credits and collections continue to be unusually good. The condition of stocks generally is very good, in spite of the poor and uncertain delivery that has obtained of late, and this is believed to be because the larger coast buyers have been well educated on the subject of advance orders.

INCANDESCENT LAMPS.—The lamp situation is critical and insufficient to supply demand.

FANS.—Fans are in great demand and orders cannot be filled.

WASHING MACHINES.—The market is very active and the demand is expected to increase.

BATTERIES.—Batteries have come into prominence with the recent activity in gas engine plants, and the slow delivery is causing some complaint.

MOTORS.—Motors are being supplied in larger quantities than ever before; nevertheless, only in sizes up to 10 hp. can the stock be kept abreast of demand. From 10 hp. to 20 hp. the demand slightly exceeds supply, and above 20 hp. the demand is far in excess of deliveries.

SEATTLE

The electrical jobbing business in the Northwest—Seattle and contiguous territory, especially—is feeling the effects of strike conditions which prevail to an alarming degree. The street railway lines in both Tacoma and Seattle are tied up by a trainmen's strike and station men in various power plants are expected to strike immediately in sympathy. A large proportion of the mills and logging camps, from the Gray's Harbor country and southwestern Washington to the Canadian boundary, are virtually closed down. The employees are holding out for an advance in wages and an eight-hour day. As the major portion of electrical jobbers' business is coming from lumber and shingle mills and shipyards, the prospects for immediate future activities are not alluring, especially if the shipyard strike materializes.

New construction is at very low ebb. Prospective builders prefer waiting until prices on building materials decrease. The amount of small work being done in any city in the Northwest is negligible. Freight conditions are about the same as reported in past weeks. Buying is very light, being just enough to supply demand. Dealers say they will make no attempt to replenish stock until a decrease in prices comes. Demands from shipyards and the government continue brisk. Credits and collections are very good.

COPPER.—Quotations remain unchanged. Demand shows slight increase while stocks are low. Conduit prices are unchanged. It is believed there will be an early advance and that the demand will be hard to supply. At present the demand is increasing.

MOTORS.—The demand is decreasing owing to labor troubles in important lines of industry. An increase is expected, however, when present difficulties are adjusted.

LAMPS.—There is a steady demand and stocks are comparatively easy to obtain.

APPLIANCES.—The market is normal and considered satisfactory for domestic appliances. Good prices are received.

FANS.—A slight increase in sale of fans due to prevailing warm weather has been noticed, and demand is considered unusual.

METAL MARKETS CONDITIONS

Price of Electrolytic Copper Falls to 26½ Cents in Stagnant Market

For some time there has been virtually no market for metals, and last week simply bore this out further. Neither buyers nor sellers are showing any activity. Prices are down somewhat, especially copper. Electrolytic fell to 26½ cents. It is doubtful, however, if any quantity could be purchased at this price.

Electrolytic copper was quoted in New York on Monday nominally as follows: July, 26.5 cents; August, 25.75 cents; third quarter, 25.5 cents; fourth quarter, 24.25 cents.

NEW YORK METAL MARKET PRICES

	July 16	July 23
	£ s d	£ s d
Copper:		
London, standard spot	130 0 0	130 0 0
Prime Lake	29.00 to 30.00*	28.00 to 29.00*
Electrolytic	28.75 to 29.25*	26.25 to 26.75*
Casting	27.75 to 28.25*	25.00 to 25.50*
Wire base	36.00 to 37.00*	35.00 to 36.00*
Lead, trust price	11.00	11.00
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	19.00	19.00
Spelter, spot	8.75 to 8.85	8.55 to 8.67½
Tin, Straits	62.00	62.50
Aluminum, 98 to 99 per cent	52.00 to 54.00*	51.00 to 53.00*
OLD METALS		
Brass, heavy	15.00 to 15.50	15.00 to 15.25
Brass, light	12.50 to 13.00	12.00 to 12.50
Heavy copper and wire	25.50 to 26.00	23.50 to 24.00
Lead, heavy	8.75 to 9.25	8.50 to 8.75
Zinc, old scrap	6.00 to 6.25	6.00 to 6.25

*Nominal.

Current Prices of Electrical Supplies

NEW YORK AND CHICAGO QUOTATIONS

The prices quoted are those prevailing in standard package or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists to contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

The variation in prices may be due to the difference in grade of products made by different manufacturers, to local conditions or to both.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List, per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE PER 1000 FT.—NEW YORK

Single-Conductor

No. 14 solid:	
Less than coil	$54.90 to $61.00
Coil to 1000 ft	48.80 to 59.17
No. 12 solid:	
Less than coil	63.90 to 71.00
Coil to 1000 ft	56.80 to 68.87

Twin-Conductor

No. 14 solid:	
Less than coil	$78.00 to $104.00
Coil to 1000 ft	75.00 to 80.00
No. 12 solid:	
Less than coil	121.50 to 135.00
Coil to 1000 ft	108.00 to 130.95

CHICAGO

Single-Conductor

DISCOUNT

Less than coil	+10%
Coil to 1000 ft	—10%

Twin-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each. Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+12% to 10%
1/5 to std. pkg.	10% to 20%
Std. pkg.	24% to 44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+10% to 12%
1/5 to std. pkg.	10% to 20%
Std. pkg.	34% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.31	.32
Barrel lots	.28	.29

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 30	.35	.35
50 to barrel	.31 to .31¾	.32 to .32¾
Barrel lots	.28 to .28¾	.29 to .29¾

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
5/16	250	$5.00
⅜	250	7.50
½	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$67.50 to $75.00	$60.00 to $68.75
⅜-in. double strip	73.75 to 75.00	63.75 to 72.00
½-in. single strip	90.00 to 100.00	80.00 to 93.00
½-in. double strip	95.00 to 100.00	85.00 to 96.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75
⅜-in. double strip	78.75	71.25
½-in. single strip	100.00	85.00
½-in. double strip	105.00	95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List, per Foot	Size, In.	List, per Foot
7/32	$0.05½	1	$0.25
¼	.06	1¼	.33
⅜	.09	1½	.40
½	.12	1¾	.47
⅝	.15	2	.55
¾	.18	2¼	.65

NET PER 1000 FT.—NEW YORK

Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.— $36.67-$55.00	$24.50-$27.50	$21.50-$24.75
¼-in.— $40.00-$60.00	$27.00-$30.00	$23.50-$27.00

NET PER 1000 FT.—CHICAGO

Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.— $36.67-$55	$25.50-$27.50	$23.10-$24.75
¼-in.— $40.00-$60.00	$30.00	$25.20-$27.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 38

Size, In.	Conduit, List per Foot	Couplings, List	Elbows, List
¼	$0.08½	$0.05	$0.19
⅜	.08½	.06	.19
½	.08½	.07	.19
¾	.11½	.10	.25
1	.17	.13	.37
1¼	.23	.17	.45
1½	.27½	.21	.60
2	.37	.28	1.10
2½	.58½	.40	1.80
3	.76½	.60	4.80

DISCOUNT—NEW YORK

	¼ In. to ½ In.	¾ In. to 3 In.
Less than 2500 lb.	6% to 8%	8% to 10%
2500 to 5000 lb.	9% to 11%	11% to 13%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

Less than	¼ In. to ½ In.	¾ In. to 3 In.
2500 lb.	3.8% to 5.8%	5.8% to 7.8%
2500-5000 lb.	6.8% to 8.8%	8.8% to 10.8%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

Net	$3.50

CHICAGO

List	$5.00 to $6.00
Discount	25% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38% to 39%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.75 to $6.30
1/5 to std. pkg.	4.50 to 5.25

Standard package, 500. List, $0.07.

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25

Standard package, 500. List, $0.07.

LAMPS, MAZDA

105 to 125 Volts

Regular, clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.27
60-watt—B	100	.36
100-watt—B	24	.65
75-watt—C	50	.65
100-watt—C	24	1.00
200-watt—C	24	2.00
300-watt—C	24	3.00
Round bulb, 3½ in., frosted:		
15-watt—G 25	50	.50
25-watt—G 25	50	.50
40-watt—G 25	50	.50
Round bulbs, 3¾ in., frosted:		
60-watt—G 30	24	.72
Round bulbs, 4⅝ in., frosted:		
100-watt—G 35	24	1.05

DISCOUNT—NEW YORK

Less than std. pkg.	Net
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	10%
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.00 to $35.17
Coil to 1000 ft.	21.00 to 26.73

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$37.84 to $38.16
Coil to 1000 ft.	28.38 to 28.62

LAMP GUARDS, WIRE

Standard packages from 50 to 150.

NEW YORK

Net per 100	$18.00 to $29.00

CHICAGO

Net per 100	$14.17 to $30.00

OUTLET BOXES

Nos.	List, per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200 S.E., 300, A.X. 1½, 4 S.	30.00
103—C.A., 9, 4 R, B 1½	25.00
106—F.A., 7, C.S. 1½, 3 R.	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	33% to net list	27% to list
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40% to 43%	35% to 37%
$10.00 to $50.00 list	50% to 53%	40% to 48%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. wire	$14.00 to $20.00
1/5 to std. pkg.	13.00 to 15.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$14.00 to $18.20
1/5 to std. pkg.	13.00 to 16.90

Standard package, 2200. List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	5½ N.C.—Nail-It—Solid Std. Pkg. 3500	N.C. Std. Pkg. 4000
Less than 1/5 std. pkg.	$10.50 to $24.30	....
1/5 to std. pkg.	9.75 to 12.15	....

CHICAGO

Per 1000 Net	5½ NC.—Solid Std. Pkg. 3500	Nail-it—N.C. Std. Pkg. 4000
Less than 1/5 std. pkg.	$10.20 to $18.00	$20.75 to $28.00
1/5 to std. pkg.	9.00 to 9.75	16.30 to 21.50

SOCKETS AND RECEPTACLES

	Std. Pk.	List
⅛-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net list
1/5 to std. pkg.	15% to 20%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	List
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

Less than $10 list	5% to +5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

DISCOUNT—CHICAGO

Less than $10 list	5% to +5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp., three-point	100	.56
10-amp., three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

SWITCHES, SNAP AND FLUSH—Cont'd

10-Amp. 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net list
1/5 to std. pkg.	16
Std. pkg.	28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%
Std. pkg.	30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar	List, Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	23% to list	....
$2.00 to $10.00 list	23% to 20%	....
$10.00 to $50.00 list	23% to 30%	....

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 50%	15% to 40%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

Net price	$3.15 to $3.50

CHICAGO

List	$4.00 to $4.50
Discount	25% to 30%

WIRE, ANNUNCIATOR

DISCOUNT—NEW YORK

No. 18, less than full spools	52%
No. 18, full spools	48%

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.6885
No. 18, full spools	0.5285 to 0.55

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

No.	Price per 1000 Ft. Net—Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00-18.00	$12.00-14.50	$11.50-12.50
12	21.06-27.05	18.96-22.85	18.01-20.95
10	29.60-39.27	26.64-33.66	25.31
8	42.40-51.44	38.16-48.42	36.25
6	72.19-89.57	64.98-76.80	61.73

CHICAGO

No.	Price per 1000 Ft. Net—Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00	$16.00	$14.00
12	29.89	25.62	21.35-23.48
10	41.51-42.28	35.58-36.24	29.65-33.22
8	51.54-60.13	47.25-51.50	42.95-47.25
6	74.80-82.20	68.00-75.35	60.50-61.20

WIRE, WEATHER-PROOF

Solid-Conductor, Triple-Braid, Sizes 4/0 to 8 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$40.25 to $45.00
25 to 50 lb.	39.25 to 42.00
50 to 100 lb.	$38.00

CHICAGO

	Per 100 Lb. Net
Less than 25 lb.	$45.00 to $45.50
25 to 50 lb.	44.00 to 44.50
50 to 100 lb.	43.00 to 43.50

NEW APPARATUS AND APPLIANCES

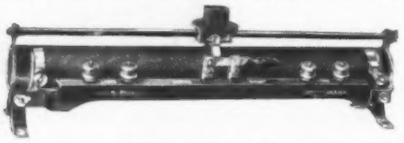
A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Magnet-Type Battery Meters

Pocket battery meters of the permanent magnet type are made by the Harvard Electric Company, 525 West Van Buren Street, Chicago. The meters are light, nickel-plated and of convenient pocket size, being 2¼ in. (5.2 cm.) in diameter, ⅝ in. (15.9 mm.) thick and 4 oz. (113 gr.) in weight. The makers claim that they are accurately calibrated and guaranteed for two years. Neither the temperature nor the weather affects their accuracy, it is pointed out. They may be read in any position, with or without the use of the flexible cable. The ammeters are used for testing dry cells, indicating the direction of current as well as its strength, and are nearly deadbeat. A flexible cable accompanies each instrument so that the total effect of the battery may also be easily determined.

Laboratory Rheostat with Sliding Contact

A rheostat in which the line and load terminals are completely differentiated and appropriately labeled is being made by James G. Biddle, 1211 Arch Street, Philadelphia, Pa. This rheostat, which was designed by Prof. H. L. Dodge of Iowa State University, has been made as nearly fool-proof as possible. Referring to the accompanying illustration, the left-hand pair of binding-posts is for the line connection, and the right-hand pair is for the load connection. Each pair is plainly marked, so that there can be no legitimate excuse for wrong connection. When the knife switch is open, the load and rheostat are connected to the line in series. By closing the switch the rheostat is placed across the line and the load arranged as a shunt around the rheostat. In either case the current in the load will be varied by moving the sliding contact in the usual way. If the switch is open with the

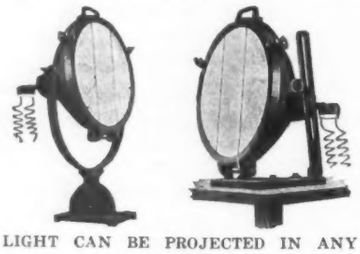


MAXIMUM RANGE OF REGULATION ALWAYS AVAILABLE

slider at the "all-in" position, the current will be cut to its lowest value on the series connection for a given load and voltage. To decrease the current below this point, the switch is closed. It then becomes possible because of the shunt connection to decrease the current in the load down to zero. All connecting wires are open so as to be readily traced. These rheostats may be used on the voltage for which they are rated, with a load of any resistance, and are always capable of providing any current value in the load between zero and the maximum current rating for the rheostat. Consequently, in every case the maximum range of regulation is available.

Floodlight Projector with One-Piece Body

Floodlight projectors that have one-piece bodies, made of either cast iron or aluminum, which form the housing for the reflector, have been developed by the George Cutter Company, South Bend, Ind. The body serves as an adequate protection against denting and abuse to the reflector, which must re-

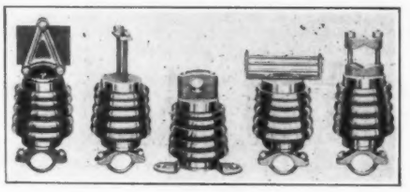


LIGHT CAN BE PROJECTED IN ANY DIRECTION

tain a true parabolic shape for correct projector lighting. In designing the metal body provision was made for changing of reflectors when it is desired to change the distribution of light. The unit can be adjusted to project the light rays in any direction, it being possible to rotate the body of the lamp through 360 deg. in any plane. Besides permitting further directional adjustment, the mounting plate lends itself readily for mounting the unit on a pipe standard, platform or pole, or it may be suspended from a ceiling or wall. Although designed particularly for the new 200-watt and 400-watt projector lamps, other lamps having concentrated filaments may be used in the unit. The socket is designed for adjustment to change the focus, the spread of the beam being altered to suit any particular condition. There are no openings in the body. The lamp is cooled by the circulation of air between the reflector and body within the parabola, the air being cooled by radiation from the body. The hinge door is fitted with sectional wire glass. It is held in place with wing nuts and may be locked with a padlock to prevent theft of the lamp.

Standardized Busbar Supports

Standardized busbar, bus-wire and bus-tube supports to meet a wide range of requirements have been brought out by the General Electric Company of Schenectady, N. Y. The insulators are



BUS SUPPORTS THAT MEET WIDE RANGE OF REQUIREMENTS

divided into two classes—one for use up to 3500 volts and the other from that voltage up to 16,500 volts. The only difference is in the two sizes of insulators to meet different voltage requirements.

Interchangeable iron caps are fastened permanently to each end of the insulators. Then to the cap which is to form the top of the insulator are fastened various supporting fittings on which bus wires, bus tubes or busbars are mounted. To the lower cap one of three different fittings, for supporting respectively on ¾-in. or 1¼-in. (1.90-cm. or 3.31-cm.) pipe, or flat surfaces, is fastened by two bolts. The construction of each fitting fastened to the bottom of the insulator is such that the insulator can be turned through an arc of 90 deg. parallel to its base and locked in any desired position by the holding bolts.

The support on the left is used for busbars on edge which must be clamped in place. This support is used also in bus compartments when provided with fitting for flat surface mounting. One part of the bus clamp is bolted to the insulator cap, the other part of the clamp to the first part. The next support is used for busbars on edge when it is desired to hold the bars in place against vertical movement, or when in bus compartments it is necessary to use a stay insulator and sectionalizing switches. The link across the top of the upright pins will hold the bus in place vertically and horizontally.

When there is no need of guard against vertical movement of the bars the uprights, nuts and cross link shown are omitted and in their place are used two uprights threaded only on the lower ends.

The third support is used for round busbars, either tube or solid. This support can be mounted upright, hori-

zontally or in an inverted position. Bare conductor is generally used with the support. This support is built for busbars of three different diameters—¾ in., 15/16 in. and 1 5/16 in. (1.9-cm., 2.4-cm. and 3.3-cm.).

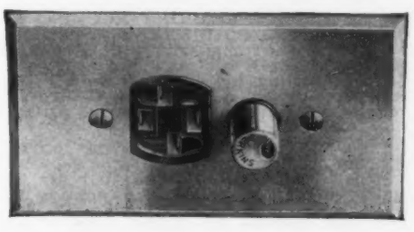
The fourth support from the left is used when busbars are placed on side. The number of horizontal cross-pieces used with this type of support will depend upon the number of busbars it is desired to support.

The support on the right is made in two sizes, one for supporting 1¼-in. (3.2-cm.) and the other for 1⅝-in. (4.1-cm.) bus wire. This support can be mounted upright, horizontally or inverted. The upper part is made of two fiber parts which are held in place by bolts running through the fiber into the insulator cap. The wire for use with this support is usually insulated.

Various other styles of top fittings are available, but the above description will serve to indicate in a general way the extent of this particular line. Ventilation is obtained by spaces between the bus lamination. When these spaces are not provided by the connection bars from breakers or switches, spacers are inserted between the bus laminations.

Switch with Current Tap

A combined outlet and light switch from which current may be tapped for the usual electrical appliances is being manufactured by the Bryant Electric Company of Bridgeport, Conn. In connecting this combination device into the circuit, the line wires may be attached to either end of the device. When the wires are tapped on the switch end the switch controls the receptacle member of the combination as well as the outgoing circuit from the switch proper. If the wires are connected to the receptacle end of the device, current may be taken off through the receptacle irrespective of the position of the switch. The switch will then control only its own outgoing circuit. In the type of switch illustrated, which has but one button, the position of the switch is indicated by the words "on" or "off," as the case may be, which show through an aperture in the end of the button. The type "O" switch unit of this combination is provided for double-pole connections only. Any of the several

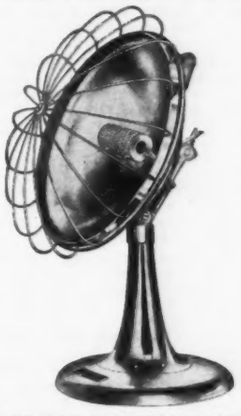


COMBINED SWITCH AND CURRENT TAP

different forms of plugs and attachment caps, either reversible or non-reversible, polarity types, can be used for plugging into this receptacle. This device is one of the Spartan receptacles and plugs made by the Bryant company.

Electric Heater Built Like Portable Lamp

A portable electric heater for home use is being manufactured by the Hotpoint Electric Heating Company of Ontario, Cal. The outfit is substantially constructed of pressed steel, on the principle of the portable lamp, care being taken to bring about lines which are symmetrical and which are pleasing to the eye. A steel reflector 9½ in. (24.1 cm.) in diameter is connected to the top of the pedestal by a hinged joint which is adjustable to numerous positions from horizontal to diagonal, upward. This reflector, which is of a special parabolic design, is heavily plated with a triple coat of highly polished copper. The back of the reflector is finished in black enamel. Wire protecting guards over the heating element are attached to a copper-plated rim. These guards may be easily removed for cleaning the reflector or changing

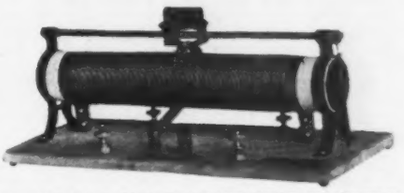


PORTABLE ELECTRIC HEATER

the heating element, which is also easily and quickly detachable. The heating element consists of a composition core 1 in. (2.54 cm.) in diameter, around which is wound high-resistance wire. The wire is first wound into a small coil and then wound around the composition core, giving a large amount of resistance material in a small area. This coil will attain a temperature of about 1200 deg. The base of this heater is made of steel, nickel-plated, and is weighted so that should the heater be accidentally tipped over while the current is on it will assume a position with the heating element pointing upward.

Laboratory Rheostat with Substantial Mounting

The design of the Dodge laboratory rheostat provides a system of wiring whereby a rheostat may be connected either in series with the load or as a shunt across the line, the change being made simply by closing a single-throw switch. By means of the slider the resistance may be varied from zero to the maximum of the rheostat. When connected in series with the load, this variation of the resistance produces a variation of the voltage across the load, the minimum of which is limited by the ratio of the load resistance to the total resistance of the circuit. The current through the load is varied in the same proportion. By closing the switch and thereby shunting the rheostat across the line, a potentiometer effect is secured by means of



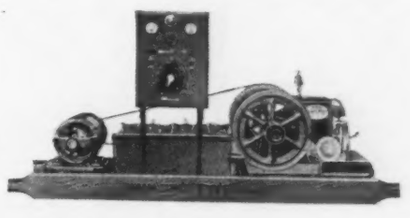
RESISTANCE OF THIS RHEOSTAT PROPERLY WORKED OUT BY MAKERS

which the voltage and current may be varied from zero to a maximum amount which is the same as the minimum of the series connection.

With this rheostat, it is claimed, it has been possible to make the voltage and current the determining characteristics. The resistance is purely incidental from the standpoint of the user. With the resistance properly worked out by the manufacturer, in relation to the other factors, resulting current capacity is the greatest which can be had with a given voltage, and within these limits every value of the voltage and current down to zero can be secured, no matter what the load. The user is thus able to choose a rheostat by voltage and current capacity. This rheostat is made by the Central Scientific Company at Chicago.

Compact Lighting and Power Plant

A compact lighting and power plant, designed for dealers to use as a demonstrator, that can be placed on a truck and transported from place to place and demonstrated at will, has been developed by the Main Electric Company of Pittsburgh, Pa. The entire plant is contained on one set of rails, including the engine, storage battery, dynamo and switchboard. The small-size switchboard used with this plant folds over, permitting the complete plant to be shipped in one box all set up, battery charged, all connections made, ready for immediate use on its arrival. This type of portable unit plant is built in sizes designed for



POWER PLANT THAT IS EASILY TRANSPORTED

25, 40, 50 and 75 lamps. All wiring is in conduit. The engine contains a waterproof built-in magneto, the batteries are inclosed, o fthe portable type, and the whole outfit is made for all-round usage.

Trade Notes

THE STANDARD UNDERGROUND CABLE COMPANY, Perth Amboy, N. J., is building a new extension to its plant.

THE CUTLER-HAMMER MANUFACTURING COMPANY announces the removal of its New Haven office to 962 Chapel Street.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, will build an extension to its plant at Nineteenth Street and Allegheny Avenue.

HERBERT C. LAW announces that he has resigned from the Brookfield Glass Company to accept a position with the American Jobbers' Supply Company, 1122 Woolworth Building, New York City.

A. C. CORNELL, who has been housegoods specialist in the St. Louis branch house of the Western Electric Company, has been appointed sales manager of the Denver (Col.) branch house of that company.

THE BLAW STEEL CONSTRUCTION COMPANY and the Knox Pressed & Welded Steel Company have consolidated under the name of the Blaw-Knox Company. The personnel of the two organizations will remain unchanged.

L. S. WASHINGTON, formerly a member of the transformer sales division of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, has recently been transferred to the St. Louis office of that company as supply salesman.

THE GENERAL ELECTRIC COMPANY will soon commence the construction of a one-story and two-story reinforced-concrete addition, 135 ft. by 250 ft., at its Edison Lamp Works, Harrison, N. J., to cost about $200,000. Bids for erection have been received.

THE SANGAMO ELECTRIC COMPANY of Springfield, Ill., has established a service station on the Pacific Coast for recalibration and repairs of Sangamo meters for territory west of Salt Lake City. The service station is at the factory of the Western Electro-Mechanical Company in Oakland, Cal.

ROBERT E. RAE, for many years with the Western Electric Company and for the last four years sales manager for Stanley & Petterson, New York City, jobbers and manufacturers, has resigned from the latter firm. Mr. Rae's plans for the future are unsettled, but he will doubtless continue along the selling line and in organizing and executive work.

THE LEEDS & NORTHRUP COMPANY, Philadelphia, announces that its factory was closed from Aug. 6 to Aug. 18. During that period practically the entire force of the company took its vacation and all production work was stopped. The new factory addition, which will double the floor space, is nearing completion, and the company expected to move into it during the vacation period.

THE GEORGE CUTTER COMPANY, South Bend, Ind., announces the addition to its sales organization of J. H. Lynch, who will operate from the company's branch office in New York City. For fifteen years Mr. Lynch has been associated with the electrical industry as a central station man, contractor and salesman. During the last five years he has been connected with the Buffalo office of the Westinghouse Electric & Manufacturing Company and has made many friends in the electrical trade in the Eastern territory.

F. H. TACKABERRY, the general agent of the American Steel Export Company, sailed from New York City on Saturday, July 7, on the Lamport & Holt steamer Vestris for South America. Mr. Tackaberry will cover a large portion of the Latin-American countries, visiting the following important cities: Rio de Janeiro, Sao Paulo, Buenos Aires, Montevideo, La Plata, Rosario, Valparaiso, Santiago, etc. Primarily, the reason of Mr. Tackaberry's trip will be to collaborate with the company's various agents throughout South America, lending every possible aid and acquainting them more thoroughly with the facilities available at the home office, and also with the market conditions in this country for iron and steel and engineering and contracting.

THE GENERAL ELECTRIC COMPANY, to meet the growth and increasing variety of applications of electric heating to the industrial field, has concentrated production of this material in a new building at the Schenectady plant. Manufacturing facilities will be increased by the exclusive use of this building, which has approximately 20,000 sq. ft. of floor space and has no dark corners. Many of the machines are developed especially to meet the unique requirements for machining, assembling and testing which occur in the production of industrial heating devices. Output of the new shop ranges from the smallest heating unit to complete equipments for industrial ovens for core baking, japan baking and for baking and drying miscellaneous materials and complete ovens for sherardizing and air tempering. In addition, the shop also produces melting pots for lead and tin alloys and many other devices for applying electric heat to the industries.

Trade Publications

INSULATORS.—The R. Thomas & Sons Company of East Liverpool, Ohio, has prepared catalog No. 16, descriptive of transmission-line insulators for all voltages.

LIGHTING SERVICE.—I. P. Frink, Inc., Twenty-fourth Street and Tenth Avenue, New York City, has issued a twelve-page booklet on "Lighting Service for Hospitals."

EXPANSION JOINTS.—Crosshead-guided expansion joints are illustrated and described in a folder now being distributed by the Ross Heater & Manufacturing Company, Inc., 753 Bird Avenue, Buffalo, N. Y.

CHARGING OUTFITS.—Special outfits for recharging ignition and lighting batteries are illustrated and described in a leaflet now being distributed by the General Electric Company of Schenectady, N. Y.

TABLEWARE.—The Hotpoint Electric Heating Company of Ontario, Cal., has prepared a bulletin descriptive of Hotpoint tableware. This bulletin takes in percolators, grills, toasters, chafing dishes, teakettles and teapots.

RHEOSTATS.—James G. Biddle, 1211 Arch Street, Philadelphia, is distributing bulletin No. 870, descriptive of its "Jagabi" laboratory rheostats. This bulletin describes sliding-contact tube rheostats, Dodge design rheostats and compression carbon rheostats.

PROJECTORS.—The National X-Ray Company of Chicago and New York is distributing a red, white and blue circular on twenty-four hours of daylight. This circular describes the X-ray projector No. 51, for use with 200-watt Mazda "C" lamps, and the Mogul No. 90 X-ray projector, which can be used with any size standard Mazda lamp having Mogul base.

STEAM SPECIALTIES.—Bulletin No. 106, descriptive of steam specialties made by the John E. Angell Steam Specialties Company, Inc., 64 West Randolph Street, Chicago, is now being distributed. This bulletin includes information on steam water heaters, ammonia separators, oil separators, steam separators, turbo-type steam separators and water-softening systems.

CIRCUIT BREAKERS.—Bulletin No. 47,419, descriptive of small-capacity industrial oil circuit breakers, is now being distributed by the General Electric Company of Schenectady, N. Y. These oil circuit breakers are for use on three-phase induction motors at 10 hp. or less. This company is also distributing a bulletin descriptive of its type CR 9510 solenoid brakes for alternating-current or direct-current motors from 1 hp. to 300 hp.

BUREAU OF MINES PUBLICATIONS.—The following publications have been issued by the United States Bureau of Mines: Bulletin 124, "Sandstone Quarrying in the United States," by Oliver Bowles; Technical Paper 82, "Oxygen Mine-Rescue Apparatus and Physiological Effects on Users," by Yandell Henderson and James W. Paul; Technical Paper 135, "Bibliography of Recent Literature on Flotation of Ores, January to June, 1916," compiled by D. A. Lyon, O. C. Ralston, F. B. Laney and R. S. Lewis; Technical Paper 140, "The Primary Volatile Products of the Carbonization of Coal," by G. B. Taylor and H. C. Porter; Technical Paper 143, "The Ores of Copper, Lead, Gold and Silver," by C. H. Fulton; Technical Paper 160, "The Determination of Nitrogen in Substances Used in Explosives," by W. C. Cope and G. B. Taylor; Technical Paper 166, "Motor Gasoline, Properties, Laboratory Tests and Practical Specifications," by E. W. Dean. These publications should be ordered by number and title. Applications should be addressed to the director of the Bureau of Mines, Washington, D. C.

New Incorporations

THE WILLIS ELECTRIC COMPANY of Cleveland, Ohio, has been incorporated with a capital stock of $15,000 by Willis W. Hale and others.

THE SPRINGFIELD (Ohio) ELECTRIC COMPANY has been incorporated with a capital stock of $2,500 by Allen H. Frost, Kirk L. Bly, Edson S. Hineline, Ralph E. Wheeler and Roscoe C. Lorentz.

THE STANDARD TUNGSTEN CORPORATION of Newark, N. J., has been chartered with a capital stock of $100,000 by G. Dazet and R. T. Rodger to manufacture lamps and tungsten specialties.

THE GROTON (N. Y.) ELECTRICAL DEVICES COMPANY has been incorporated by D. J. Watrous and B. and J. Conger of Groton, to manufacture electrical machines for heating and drying.

THE ACME ELECTRIC & MACHINE COMPANY of Cleveland, Ohio, has been incorporated with a capital stock of $15,000 by Edward Younger, Samuel Friedman, L. M. Sewell, A. C. Teare and C. A. Ninan.

THE DUQUESNE ELECTRIC & MANUFACTURING COMPANY of Pittsburgh, Pa., has been incorporated with a capital stock of $50,000 to manufacture electrical machinery, etc. E. A. Casey is treasurer.

THE ELECTRIC MOTOR & REPAIR COMPANY of Akron, Ohio, has been chartered with a capital stock of $10,000 by S. W. Sweet, Henry Kish, R. S. Whitright, W. A. Heffelman and Mead Chamberlain.

THE LONG LIGHT LENS COMPANY of Kokomo, Ind., has been incorporated with a capital stock of $25,000 to manufacture auto and vehicle headlights. The directors are: Maurice E. Louth, Fred L. Trees and Earl B. Barnes.

THE SUNLIGHT ELECTRIC MANUFACTURING COMPANY of Warren, Ohio, has been chartered with a capital stock of $50,000 by C. H. Mills, C. H. Sadler, C. L. Wood, B. B. Nick and D. R. Estabrook.

THE ROBERT A. BUCHER COMPANY of Philadelphia, Pa., has been incorporated with a capital stock of $10,000 to manufacture vacuum cleaners, etc. The incorporators are: John G. Bucher, Walter F. Eyrich and Frank A. Fisher.

THE MONROE LAMP COMPANY of New York, N. Y., has filed articles of incorporation with a capital stock of $100,000 to manufacture lamps and fixtures. The incorporators are: George Tiernan, F. H. Parcells and J. B. Purcells.

THE PETERSON STORAGE BATTERY COMPANY of Hempstead, N. Y., has been incorporated by Christian Petersen, John Petersen and Andrew Petersen. The company is capitalized at $10,000 and proposes to deal in storage batteries and operate a garage.

THE T. A. GILLESPIE COMPANY of Gillespie, N. J., has been incorporated by Thomas H. Gillespie, H. S. Morrow and R. A. Johnston of New York, N. Y. The company is capitalized at $500,000 and proposes to do a general contracting and electrical engineering business.

THE W. J. SMYTH CORPORATION of New York, N. Y., has been incorporated by R. J. Smyth, A. A. Notzen and S. M. Louis, 51 Chambers Street, New York City. The company is capitalized at $20,000 and proposes to deal in dynamos, machinery, foundry and factory supplies.

THE JESSEMERE CONSTRUCTING & CONTRACTING COMPANY of New York, N. Y., has been chartered with a capital stock of $100,000 to do general construction, contracting and electrical work. The incorporators are: A. Hallow, S. W. Weber and R. S. Davidson, 227 Riverside Drive, New York City.

THE CARROLL COMPANY of Larksville, Pa., has been incorporated by John A. Carroll, Thomas J. Bremen and R. J. Walsh, all of Larksville. The company is capitalized at $25,000 and proposes to install and operate an electric-light plant in Larksville and erect electric transmission lines to nearby towns.

THE INDUSTRIAL ELECTRIC FURNACE COMPANY of Indianapolis, Ind., has been incorporated by Charles B. Sommers, Charles B. Fletcher, F. von Schlegell, F. T. Snyder and S. A. Fletcher. The company is capitalized at $500,000 and proposes to construct electric furnaces and iron and steel products. The factory will be located in Indianapolis, Ind., and offices will be maintained in Chicago, Ill.

New England States

PORTSMOUTH, N. H.—Arrangements have been made whereby the Rockingham Light & Power Company is to furnish energy to operate the system of the Portsmouth & York Street Railway Company.

ST. ALBANS, VT.—The St. Albans & Swanton Street Railway Company has purchased two 650-kw. generators to be installed at the Fairfax plant of the Public Electric Light Company. George A. Murch is general manager.

FISHERVILLE, MASS.—Howard G. Ramsey of Uxbridge has been awarded the contract for wiring and fixtures in 123 houses for the Fisherville (Mass.) Manufacturing Company. Work will begin at once.

FITCHBURG, MASS.—A plan for a uniform lighting system throughout the city, and the installation of heavier units in the business section is under consideration. It is proposed to replace the arc lamps now in use with incandescent lamps of various candlepower with strong reflectors. The Fitchburg Gas & Electric Company has the contract for street-lighting.

LENOX, MASS.—The Lenox Electric Company has awarded a contract for laying 8000 ft. of underground cable and 40,000 ft. of overhead wire between Lenox and Lenoxdale, to the Rogers Electric Company of Lenox.

MARLBORO, MASS.—Work has started by the Marlboro Electric Company on the installation of the ornamental lighting system on Main Street.

QUINCY, MASS.—Contract has been awarded by the Fore River Shipbuilding Corporation of Quincy for the construction of a machine shop, 135 ft. by 250 ft., one story, and a boiler house, 72 ft. by 150 ft., one story.

READING, MASS.—The town of Reading has adopted all the recommendations of C. W. Whiting, consulting engineer, and will retain and improve the municipal electric-light plant. The voters have authorized an appropriation of $55,000 to carry out the plan.

WORCESTER, MASS.—The Worcester Electric Light Company has applied to the Board of Aldermen for permission to construct conduits in Crystal, Madison, Grafton, Franklin, Garden and Main Streets.

HARTFORD, CONN.—The stockholders of the Hartford Electric Company have voted to increase the capital stock from $4,500,000 to $6,000,000, the proceeds to be used to take care of the growing business and for improvements under way at the Dutch Point plant, where a 10,000-kw. turbine is being installed, to be followed by another.

SEYMOUR, CONN.—The joint petition of the Seymour Electric Light Company and the Beacon Falls Electric Light Company to the Public Utilities Commission for the approval of a lease by the Seymour company of the rights and privileges of the Beacon company has been withdrawn.

Middle Atlantic States

BINGHAMTON, N. Y.—Preparations are being made by the Binghamton Light, Heat & Power Company for the installation of new equipment at its power house extension now under construction. Foundations for machinery are now being built and settings for new water-tube boilers. This plant is under the management of W. S. Barstow, 50 Pine Street, New York City.

BROOKLYN, N. Y.—The plans for the new hospital building, to be erected at Troy Avenue and Crown Street by the Carson C. Peck Memorial Hospital, provide for a new power house. C. S. Meerbard, 230 Fulton Street, is representative of hospital; Ludlow & Peabody, 101 Park Avenue, New York City, are architects.

BUFFALO, N. Y.—The International Traction Company, the holding company of the International Railway Company, has purchased a coal mine in the Pittsburgh district and will now be able to furnish its New York State railway lines with adequate coal supply. The International Railway Company is now receiving about 75 per cent of its power from the Niagara Falls hydroelectric power plants. This does not provide for the entire peak loads and the company has to supplement its water-power supply by its own generating plants.

CHATHAM CENTER, N. Y.—Steps have been taken by residents of Chatham Center to secure an electric-lighting service for the town. It is proposed to ask the Chatham (N. Y.) Electric Light Company to extend its lines here.

FRANKFORT, N. Y.—Plans have been prepared by the Savage Arms Corporation, Savage Avenue, Frankfort, for four new additions to its plant, to consist of three machine shops, two four stories, 50 ft. by 280 ft., and 50 ft. by 220 ft. respectively; one one-story, 35 ft. by 270 ft., and a two-story office building; an electric power house will also be built. Contract for construction of buildings, it is reported, has been awarded to John G. Brown, Witherspoon Building, Philadelphia, Pa. F. R. Phillips is assistant manager.

LANCASTER, N. Y.—The Public Service Commission has granted the Depew & Lancaster Light, Power & Conduit Company permission to issue $45,000 in capital and $100,000 in bonds, the proceeds to be used solely for extensions and improvements to its system.

NEW YORK, N. Y.—The Central Park West Civic Association is considering the installation of an ornamental lighting system in Central Park West district.

NEW YORK, N. Y.—The American Light & Traction Company has purchased the properties of the White Star Coal Company in Harlan County, Kentucky. This mine is now being developed and will supply several subsidiaries with fuel.

NEW YORK, N. Y.—The Long Island Lighting Company has petitioned the Public Service Commission for permission to issue $130,000 in bonds and $100,000 in capital stock, the proceeds to be used for reconstruction equipment and working capital.

NIAGARA FALLS, N. Y.—The City Council has granted the International Railway Company of Buffalo permission to erect overhead cables along Twenty-fourth Street to its new substation.

ROCHESTER, N. Y.—In connection with the rebuilding of the new power station No. 5 of the Rochester Railway & Light Company at the foot of the lower falls of the Genesee, it is proposed to carry the power cables that cross to the west side of the river in a groove cut in solid rock at the brink of the falls. This groove will be large enough to accommodate forty-eight 4-in. ducts. On the west side of the river the cables will be carried to a subway now building in Hastings Street.

SHERMAN, N. Y.—The Board of Trustees has applied to the Public Service Commission for authority to establish and operate a municipal electric-light plant in Sherman.

SOLVAY, N. Y.—An extension will be built to the boiler house of the Solvay Process Company to provide space for the installation of two additional units. The present boiler capacity is about 12,000 hp.

ALLENHURST, N. J.—The Atlantic Coast Electric Company of Asbury Park is building an extension to its power station at Allenhurst.

BAYONNE, N. J.—The City Commission is negotiating with the Public Service Electric Company for the extension of the ornamental street-lighting system on Broadway from Fifth Street to Eleventh Street, in accordance with its contract with the city.

BAYONNE, N. J.—Plans have been filed by the Electric-Dynamic Company of Bayonne, N. J., for the construction of an addition, 100 ft. by 120 ft., one story, to its plant at Avenue A and North Street. Contract has been awarded to John W. Ferguson, 152 Market Street, Philadelphia, Pa.

BORDENTOWN, N. J.—The Council is considering the installation of a new fire-alarm system.

CALDWELL, N. J.—Bids will be received by the committee on public buildings of the Board of Chosen Freeholders of Essex County, Essex County Court House, Newark, N. J., until Aug 1 for furnishing material and labor in connection with the electrical work in the power house and tunnel at the Essex County Penitentiary at Caldwell. Plans and specifications may be seen at the office of Runyon & Carey, consulting engineers, 845 Broad Street, Newark, N. J.

NEWARK, N. J.—Bids will be received by the Board of Freeholders until Aug. 2 for extensions and improvements to the power plant at the Essex County Hospital at Overbrook. Runyon & Carey, 845 Broad Street, Newark, are consulting engineers.

NUTLEY, N. J.—The installation of a new fire-alarm signal system is under consideration by the Town Commission.

TRENTON, N. J.—The Trenton & Mercer County Traction Corporation is considering an extension of its system to the heart of Trenton Junction.

TRENTON, N. J.—The Public Service Electric Company is planning to remove its aerial lines on a number of the city streets, to be paved, and will place its wires in underground conduits.

TRENTON, N. J.—Permission has been granted the Eureka Power Company, a subsidiary of the New Jersey & Pennsylvania Traction Company, by the Public Utility Commission to erect an electric transmission line along the River Road from Ewing Township to Hunterdon County boundary line. The lines will be extended from Washington Crossing to Titusville and Pennington.

VENTNOR CITY (P. O. ATLANTIC CITY), N. J.—The City Council is considering the installation of a new street-lighting system in Ventnor City. It is proposed to replace the arc lamps now in use with incandescent lamps.

ALTOONA, PA.—The Public Service Commission has granted the Penn Central Light & Power Company permission to issue $271,000 in bonds for extensions and improvements.

ERIE, PA.—The Erie Light Company has received authority from the Public Service Commission to issue $1,650,000 in bonds, the proceeds to be used for improvements, extensions and other purposes.

GETTYSBURG, PA.—The Public Service Commission has authorized the Gettysburg Electric Company to issue $55,000 in bonds, the proceeds to be used for extensions and improvements.

MOUNT CARMEL, PA.—The property of the Edison Electric Illuminating Company has been acquired by interests represented by Chandler & Company of Philadelphia. The Edison Company operates in Mount Carmel, Marion Heights, Connersville and vicinity.

PHILADELPHIA, PA.—Plans have been prepared by the Philadelphia Electric Company for the erection of an addition, 33 ft. by 95 ft., one story, to its power station on Kensington Avenue, for which bids have been asked.

PHILADELPHIA, PA.—The Department of Public Works has awarded a contract for electrical work in the new public library building at Nineteenth Street and the Parkway to L. K. Comstock & Company, 30 Church Street, New York, N. Y., at $44,700. The building complete will cost about $2,650,000. Former contract awards were annulled, owing to technical errors.

PHILADELPHIA, PA.—The property of the Lehigh Navigation Electric Company, a subsidiary of the Lehigh Coal & Navigation Company, the Northern Central Company and the Lehigh Valley Transit Company has been acquired by the Electric Bond & Share Company, 71 Broadway, New York, N. Y. The companies will be merged and extended through the district, which includes a large coal-mining area affording possibilities for electric power service.

PHOENIXVILLE, PA.—The City Council is considering the installation of a municipal electric-light plant.

QUAKERTOWN, PA.—Bonds to the amount of $45,000 have been authorized for the reconstruction of the municipal electric-light plant and the installation of new machinery.

ROCKWOOD, PA.—Work has been started on the construction of an electric power plant in Rockwood by the Penn Electric Service Company of Somerset. The plant will be located on the Casselman River and will furnish electricity for mining operations in the Berlin, Myersdale and Blackfield districts and as far west as Ohiopyle, and also for the new signal system being installed on the Baltimore & Ohio Railroad between Cumberland and Connersville.

SCRANTON, PA.—The Public Service Commission has granted the Scranton Electric Company permission to issue $77,000 in bonds for improvements and extensions to its system.

WILKES-BARRE, PA.—The City Council is planning for an early contract award to the Wilkes-Barre Lighting Company for street-lighting service in accordance with permission granted by the Superior Court for this new organization to enter into competition with the Wilkes-Barre Company, which furnishes the local service. The new company has submitted a bid to the city for street-lighting service on a five and seven-year contract, which would result in a saving of $33,000, and $7,000 on

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

standards and special public square lighting.

YORK HAVEN, PA. — Work has begun on the erection of a large dam in the Susquehanna River, between the Three-Mile Island and the Dauphin County shore, near York Haven, for the York Haven Power Company. The dam will be 800 ft. long and will cost from $15,000 to $20,000.

RICHMOND, VA.—The Virginia-Carolina Company is planning to equip its proposed new plant at Wasnington, N. C., for electrical operation. H. C. Bragaw is plant superintendent.

North Central States

DETROIT, MICH.—Extensions and improvements, involving an expenditure of about $2,000,000, are being made by the Detroit Edison Company. The work will include the installation of the initial unit of a heating plant being erected at Congress Street and Cass Avenue at a cost of $1,000,000, and an addition to its Connors Creek power plant.

GRAND RAPIDS, MICH.—Plans are being considered for increasing the output of the municipal electric-light plant.

GRAND RAPIDS, MICH.—The construction of a building, to cost about $20,000, on the west side canal, is under consideration by the Eastern Michigan Power Company. Machinery will be purchased.

GRAND RAPIDS, MICH.—Deeds have been filed by the Consumers' Power Company for a right-of-way from the Grand Rapids city limits through Alpine and Sparta townships to the Ottawa County line, to be used for a railway and transmission system.

MONROE, MICH.—An extension, it is reported, will be erected to the power station of the Detroit, Monroe & Toledo Short Line Railway Company in Monroe and an additional generating unit installed.

MOTTVILLE, MICH.—Bids will be received at the office of Gardner S. Williams, consulting engineer, Cornwell Building, Ann Arbor, until Aug. 6 for construction of a reinforced concrete and brick power house, concrete multiple-arch spillway, Tainter gate sections, earth embankment and tailrace excavation for the Mottville plant of the St. Joseph Power Company on the St. Joseph River, at Mottville. For details see Searchlight Section.

PONTIAC, MICH.—Bids will be received at the office of the secretary of the board of education of Pontiac Union School, Pontiac, until Aug. 1, for furnishing an electric generator and engine equipment at the High School. Plans and specifications may be obtained from Perkins, Fellows & Hamilton, architects, Straus Building, Chicago, Ill., or Fisher Brothers, architects, Pontiac.

RED JACKET, MICH.—The municipal conduit system for electric wires, which is leased by the Houghton (Mich.) County Electric Light Company, has been so badly damaged by sinking ground that it will be necessary to rebuild it, at a cost of about $20,000; otherwise the company will erect pole lines.

BOWLING GREEN, OHIO.—Bids will be received at the office of the auditor of Wood County, Bowling Green, until Aug. 6 for furnishing material and installing electric wiring, lamps and fixtures in the Wood County Infirmary buildings near Bowling Green. Plans and specifications may be obtained upon application to S. P. Stewart & Sons, architects, Bowling Green. R. S. Gillespie is county auditor.

CANTON, OHIO.—Plans are being considered by the County Commissioners for remodeling the lighting system in the county court house, at a cost of from $3,000 to $4,000.

CANTON, OHIO.—The city service director has notified the City Council that rewiring of the auditorium according to requirements of the Ohio electrical wiring code is necessary. The cost of the work is estimated at $8,000.

CINCINNATI, OHIO.—The City Council has authorized extensions to four of the Cincinnati Traction Company's lines, which will require an expenditure of more than $250,000 before the end of the year.

CINCINNATI, OHIO.—An estimate of the cost of extending the ornamental lighting system to the suburban streets has been submitted by Service Director Barlow to City Manager Waite. The erection of 1066 additional poles would require an expenditure of $38,376, of which the city would bear $6,143 and the property owners the remainder.

CINCINNATI, OHIO.—The Union Gas & Electric Company is planning to erect two substations to provide for the increasing demand for electrical service in the suburban districts. A contract has been awarded for a new building, 50 ft. by 115 ft., in Elmwood, and a building has been leased in Evanston for five years for use as a substation, although it will be used as a warehouse for the present.

CLEVELAND, OHIO.—Steps have been taken by property owners in the Lorain Avenue district to install an ornamental lighting system on Lorain Avenue from West Twenty-fifth Street to West Fifty-eighth Street. The Lorain Avenue Business Men's Association has raised $6,000 to pay for the system.

COLUMBUS, OHIO.—Plans are being prepared for the erection of three new buildings at the Ohio University, to cost about $430,000. A new power house, to cost about $200,000, is included among the proposed improvements.

ELYRIA, OHIO.—The Elyria Telephone Company is considering the erection of a new telephone exchange building, to cost about $50,000.

NELSONVILLE, OHIO.—The Hocking-Sunday Creek Traction Company is contemplating the construction of a substation, to cost about $10,000.

WADSWORTH, OHIO.—The city authorities are considering the construction of a municipal ice plant, to utilize exhaust steam at the municipal electric power plant.

ASHLAND, KY.—Bids will be received by the city of Ashland until Aug. 6 for the installation of an ornamental street-lighting system. F. W. Geslang is city engineer.

HELLIER, KY.—The Greenough Coal Company, recently organized by Thomas J. Mitchell of Uniontown, Pa., and associates, is reported to be considering the installation of an electric power plant on its coal properties here.

JACKSON, KY.—The electric-light and power plant of the Day Lumber & Coal Company has been taken over by Lewis Hays, Jr., Ryland C. Musick and M. G. Center.

LOUISVILLE, KY.—The United States government has awarded the Louisville Gas & Electric Company a contract to supply electricity (1000 kw.) for the new army cantonment being erected south of Louisville. About 17,000 40-watt lamps will be used for buildings, and the pumping load will require about 100 kw.

OWINGSVILLE, KY.—The local electric-light plant has been purchased by James M. Richards and E. V. Brother. The new owners, it is understood, will erect a new plant, to be driven by a 75-hp. engine.

SYRACUSE, IND.—The property of the Syracuse Power & Light Company has been sold to the Hawkes Electric Company of Goshen, for $70,000. The plant furnishes electricity for lamps and motors in Syracuse, Milford, Benton, Lake Wawasee and points in this section of the State.

CHICAGO, ILL.—Plans have been approved by the engineering staff of the Sanitary District Board for operating the proposed Calumet pumping station by electricity. The Sanitary District Board authorized a committee to negotiate with Frank I. Burnett, commissioner of public works, for turbine engines and other apparatus to be taken over from the city and used for street-lighting, at an estimated saving of $70,000 per year.

FREEPORT, ILL.—The Rockford & Interurban Railroad Company of Rockford is contemplating the construction of a station and extending a loop around the city.

LINCOLN, ILL.—The property of the Lincoln Water & Light Company has been sold to W. W. Levering of Philadelphia, Pa., and Chester Snyder of Easton, Pa.

APPLETON, WIS.—The local power house of the Wisconsin Traction, Light, Heat & Power Company was recently damaged by fire, causing a loss of about $5,000.

APPLETON, WIS.—Contracts, it is reported, will soon be awarded for the construction and equipment of an addition to the boiler house, 40 ft. by 60 ft., at Appleton College, to cost about $20,000 complete. Van Ryn & DeGelleke, Caswell Block, Milwaukee, are architects.

LANCASTER, WIS.—The State Railroad Commission has granted the Mid-Continental Utilities Company, successor to the Lancaster Light & Power Company, permission to issue $275,000 in capital stock and $650,000 in bonds.

MILWAUKEE, WIS. — Extensions and improvements involving an expenditure of approximately $1,000,000 during the next few months are under consideration by the Wisconsin Telephone Company. About $342,343 will be expended on the local system and $643,548 for additions and repairs throughout the state.

MONTICELLO, WIS.—The proposal to issue $5,650 in bonds for improvements to the municipal electric-lighting system is under consideration.

RACINE, WIS.—Preparations are being made by the Racine Rubber Company to enlarge its steam generating plant. New equipment, it is understood, will be purchased, including an engine, generator, boiler and automatic stoker.

RIPON, WIS.—A site has been purchased by Libby, McNeil & Libby of Chicago, Ill., upon which they propose to erect a milk condensing and refrigerating plant, to cost about $50,000.

CLOQUET, MINN.—The General Light & Power Company of Cloquet, which operates plants in Cloquet, Carlton, Scanlon, Pipestone, Willow River and Floodwood, has sold $175,000 in bonds, the proceeds to be used to pay for the Pipestone plant and to make new extensions and improvements.

GRAND RAPIDS, MINN.—Bids will be received by the Commissioners of Itasca County Court House, Grand Rapids, until Aug. 6, for construction of a hospital building, including general construction, electric work, heating, plumbing, elevator, hospital, laundry and kitchen equipment, etc., to be erected at Grand Rapids. Bids will be received for the entire work or separately. Plans and specifications may be obtained at the office of F. H. Mosse & Company, architects, Rochester, Minn., upon deposit of $10. Copies of plans and specifications may be seen at the offices of the county auditor, the architects, and the Builders' Exchanges of St. Paul, Minneapolis and Duluth, and the Minneapolis Builders' Material Exhibit.

RICE, MINN.—A special election will soon be held to vote on the proposal to install an electric-lighting system in Rice.

DES MOINES, IOWA.—The Iowa Telephone Company, 1006 Grand Avenue, is planning to install a telephone system at Camp Dodge.

DES MOINES, IOWA.—A new turbine will be installed at the power house of the Des Moines City Railway Company, doubling the capacity of the plant. A substation will be erected south of South Park to increase the carrying capacity of the Fort Des Moines line; another substation is being built at East Second and Walnut Streets to take care of the east side, and still another is being completed at West Fourteenth Street to supply the interurban and part of the city lines. A new station will also be constructed at Polk Boulevard and Chamberlain Avenue, for the west lines.

MUSCATINE, IOWA.—Preliminary plans have been prepared for equipping the Muscatine, Burlington & Southern Railway for electrical operation within the next few months. The cost is estimated at about $200,000.

SAC CITY, IOWA.—At an election to be held Aug. 3, the proposal to issue $60,000 in bonds for a municipal electric-light plant will be submitted to the voters.

STATE CENTER, IOWA. — The Iowa Railway & Light Company of Cedar Rapids is reported to be contemplating the erection of a high-tension transmission line from Marshalltown to State Center.

BERNIE, MO.—The Lasswell & Coble Electric Company is contemplating the construction of an electric plant in Bernie to cost about $5,000.

COLUMBIA, MO. — Interests connected with the Illinois Traction System of Champaign, Ill., it is reported, contemplate erecting electric transmission lines to supply electricity to several towns in the northeastern part of the State, as far south as Columbia and possibly Jefferson City.

BOWMAN, N. D.—The local electric-light plant is reported to have been purchased by the Dakota Utilities Company, which operates a number of plants in South Dakota.

KENSAL, N. D.—The Kensal Electric Light & Power Company, recently organized, is planning to erect an electric plant here, to cost about $6,000.

NEW ROCKFORD, N. D.—The General Utilities Corporation will in the near future have in service about 50 miles of electric transmission line and will serve the towns of Amery, Clear Lake, Clayton, Turtle Lake, Almena, Comstock, Joel, Little Falls and Cumberland, all in Wisconsin. At present it has one small water power developed and is engaged in developing another in which a 500-kw. generating unit will be installed. It also has another power site upon which can be developed more than double the combined capacity of the two present plants. W. R. Haney is local manager.

RUGBY, N. D.—The local electric-light plant has been taken over by the Northern States Power Company of Chicago, Ill. Energy to operate the system in Rugby will be supplied by the Minot division.

ABERDEEN, S. D.—The Aberdeen Light & Power Company is installing an additional 256-hp. Stirling boiler and a 1000-kw. General Electric turbo-generator set in its power house.

ABERDEEN, S. D.—Bids will be received by the Regents of Education of the State of South Dakota, Aberdeen, until Aug. 13, for construction of the proposed ladies' dormitory, including general contract, electric wiring, heating and plumbing, to be erected on the campus of the Northern Normal and Industrial School at Aberdeen. Plans and specifications may be seen at the office of the secretary of the school and at the office of George Fossum, architect, Aberdeen.

AGRA, KAN.—Preparations are being made by the city of Agra for the installation of an electric-lighting system for which $8,000 in bonds were recently voted. Energy for operating the system will be obtained from the electric plant in Phillipsburg, 12 miles distant. The plans provide for an ornamental lighting system, consisting of one-lamp standards erected in the center of the street. D. L. Strongquist of Abilene, Kan., is supervising engineer.

BUNKERHILL, KAN.—The installation of a municipal electric-light plant in Bunkerhill is under consideration.

COLDWATER, KAN.—The Municipal Water and Light Department is contemplating, in the near future, the installation of a deep-well motor-driven pump of about 150 gal. per minute capacity, and would like to communicate with manufacturers of pumps. L. A. Baldwin is superintendent.

CONCORDIA, KAN. — The Concordia Electric Light Company, it is reported, is contemplating the erection of an electric-transmission line through Haddam, Agenda, Cuba, Morrowville and Washington. The towns are to vote bonds to build the lines; the bonds are to be retired by the company in ten years.

FULTON, KAN.—The Council has passed an ordinance granting the Pleasanton (Kan.) Electric Power Company a franchise to furnish electricity in Fulton for a period of 20 years.

HIAWATHA, KAN.—Improvements to the street-lighting system are under consideration by the Community Commercial Club.

LEONORA, KAN.—At an election held recently the proposal to issue bonds for the installation of an electric-light plant in Leonora was carried.

PAOLA, KAN.—An election will soon be called to vote on the proposal to grant the Paola Electric Company a new franchise.

SALINA, KAN.—The United States Automatic Fire Alarm Company, which was recently granted a franchise to operate in the city, is planning to erect a building and install a system at a cost of about $40,000.

SALINA, KAN. — The Salina Light, Power & Gas Company has submitted a proposal to the City Council offering to replace the arc lamps now in use with ornamental lamps. It is proposed to remove one-third of the lamps each year, completing the work in three years.

WETMORE, KAN.—A movement is under way to secure an electric-lighting service for Wetmore. It is proposed to tap the transmission line of the Holton (Kan.) Light Company which serves Circleville.

Southern States

MOCKSVILLE, N. C.—The City Council is considering issuing bonds for the installation of an electric-light plant and water-works system.

FLORENCE, S. C.—Extensive improvements are being made by the Carolina Central Electric Company to its local plant and system, involving an expenditure of about $90,000. The company is also erecting an electric transmission line to Marion to supply electricity there and to the towns of Timmonsville and Darlington. It has recently closed a contract with the Pee Dee Brick Company to operate the machinery in the brick plant.

FLORENCE, S. C.—The properties of the Carolina Central Electric Company, which owns and operates lighting plants in Florence, Darlington, Marion, Timmonsville and Summerville, has been taken over by the Yadkin River Power Company of Rockingham, N. C., a subsidiary of the Carolina Light & Power Company. Arrangements are being made by the local company to install additional equipment to furnish energy to its subsidiary plants in Darlington, Marion, Mullins and Timmonsville from the local power station.

GREENVILLE, S. C.—The Southern Power Company of Charlotte, it is reported, contemplates the erection of an electric transmission line to the army cantonment near Greenville, to cost about $30,000.

ATLANTA, GA.—The Atlantic Steel Company is planning to install new hoop mill machinery, and has placed orders for one 550-hp. alternating-current and one 250-hp. direct-current motor. Energy will be secured from the Georgia Railway & Power Company.

ATLANTA, GA.—The contract for electrical work for the army cantonment at Silver Lake has been awarded by Arthur Tufts, Candler Annex, Atlanta, general contractor for the army cantonment at Silver Lake, to the Russell Electric Company of Atlanta. The work will include wiring over 90 miles of streets, interior wiring of houses, erection of power plants, installation of generators, transformers, motors, electric fixtures, etc.

AUGUSTA, GA.—A franchise has been obtained by R. J. Edenfield of Augusta, Ga., and W. E. Moore & Company of Pittsburgh, Pa., engineers, who, it is said, propose to construct a hydroelectric plant near Augusta.

MARIETTA, GA.—The Marietta Mining Company has closed a contract with the Georgia Railway & Power Company for energy to operate machinery in getting out pyrites. The mines are located about 2½ miles east of Marietta.

MOULTRIE, GA.—The Moultrie Packing Company is contemplating extension to its plant (doubling the output), at a cost of about $300,000. It is proposed to enlarge and remodel power plant, 100-ft. extension to main building; four-story addition, 80 ft. by 80 ft., for meat storage, and enlarging other departments. E. L. Brooks is manager.

PORT WENTWORTH, GA.—Plans have been prepared for the erection of a model town at Port Wentworth, a few miles outside of Savannah, for William Morris Imbrie & Company, who have financed several industrial concerns located at this point. The proposed city will have its own water supply, lighting plant and sewerage system. Charles W. Leavitt, landscape architect and engineer, will have charge of the project. Port Wentworth has not a post office.

JACKSONVILLE, FLA.—The City Commission is considering the purchase of a new alternator for the municipal electric-light plant.

ORLANDO, FLA.—The city of Orlando is contemplating the installation of an electric-light plant and water-works system.

CHATTANOOGA, TENN.—Plans are being considered by the Tennessee Paper Company, recently incorporated, for equipping its proposed new mill for electrical operation. The cost of the mill is estimated at $150,000.

CLARKSVILLE, TENN.—The Young Men's Club of Clarksville has begun a campaign to raise funds for the installation of an ornamental lighting system in the business section of the city, to cost about $5,000.

MEMPHIS, TENN.—Plans for the consolidation of the Merchants' Power Company and the Consolidated Gas & Electric Company are about completed, in accordance with terms made with the city last winter.

BIRMINGHAM, ALA.—The Tennessee Coal, Iron & Railroad Company is contemplating the installation of new electrical machinery to operate its proposed blooming and finishing mills to be erected in the Fairfield district.

DOTHAN, ALA.—The City Council has closed a contract (over the Mayor's veto) with the South Alabama Power Company to furnish electricity to the city for a period of ten years. This action by the Council means the construction of a hydroelectric development on the Omussee Creek, 18 miles east of Dothan, by the power company, to cost about $200,000, on which work will begin at once.

JASPER, ALA.—Petitions have been filed with the Public Service Commission seeking the transfer of the Jasper (Ala.) Light & Water Company and the Attalla (Ala.) Waterworks Company to the Alabama Power Company of Birmingham.

JASPER, ALA.—The City Council has granted the Alabama Power Company a 30-year franchise to operate in this city. The company has purchased the local electric plant and is erecting a transmission line from its emergency plant near Parrish into Jasper. The company, it is expected, will extend its line from Cordova to furnish service here.

GURDON, ARK.—The Gurdon Electric Company has recently completed the installation of an ornamental street-lighting system and is considering the installation of a larger generator in a mill close by for emergency use. T. H. Akers is manager.

LITTLE ROCK, ARK.—The Quartermaster's Department has awarded the Little Rock Railway & Electric Company a contract to furnish electricity to the Twelfth Division cantonment near Little Rock.

LITTLE ROCK, ARK.—Tentative plans of the Little Rock Railway & Electric Company to extend its lines to the cantonment of the Twelfth National Army north of Fort Logan H. Roots have been abandoned owing to the inability of the company to secure steel rails.

PINE BLUFF, ARK.—Within the next six weeks the Pine Bluff Company expects to purchase one 2500-kw. turbo-generator and two 600-hp. boilers.

ARDMORE, OKLA.—Plans are being considered by the Ardmore Railway Company for the construction of a system of electric interurban railways covering the entire Healdton, Fox and other oil fields.

BUTLER, OKLA.—An issue of $6,000 in bonds for the construction of a municipal electric-light plant in Butler has been approved by Attorney General Freeling.

HEALDTON, OKLA.—Sites have been purchased in Healdton for an electric light plant, ice factory and a cotton gin plant and for three oil refineries.

KENEFIC, OKLA.—At an election held recently the proposal to grant W. A. Baehr and associates a franchise to supply electricity in Kenefic was carried.

SENTINEL, OKLA.—An election will soon be called to vote on the proposal to issue $15,000 in bonds for improvements to the electric-lighting system and extension to sewers.

TULSA, OKLA.—Improvements are contemplated by the Public Service Company of Tulsa to its local power plant, to cost about $15,000.

TULSA, OKLA.—Bonds to the amount of $1,042,500 have been voted, of which $35,000 will be used to enlarge fire-alarm system, installation of additional alarm boxes in the business and residential section and complete equipments in West Tulsa and Kendall.

ALVIN, TEX.—The Alvin Light & Ice Company, recently incorporated with a capital stock of $15,000, is planning to build an electric-light plant and ice factory. C. A. Leavens is a stockholder.

BEAUMONT, TEX. — The Beaumont Shipbuilding & Dry Dock Company, recently organized, is planning to construct a shipbuilding plant on Island Park to build ships of 4000 tons capacity and under. The plans provide for a power-house, 40 ft. by 25 ft. C. O. Yoakum is vice-president and manager.

BEEVILLE, TEX.—The contract for the construction of the proposed municipal electric-light plant has been awarded to John S. Fenner of Beeville at $15,500.

DALLAS, TEX.—C. H. Alexander, president of the National Hydro-Electric & Conservation Company, has submitted a proposal to the City Commission offering to furnish energy to the extent of 20,000 continuous horsepower at 1 cent per kw.-hour for a period of 30 years. The plant is now under construction at Marble Falls, on the Colorado River, 50 miles above Austin, and 150 miles from Dallas. In case the contract is awarded the city would have to erect a distribution system or make arrangements with some other company to distribute electricity to consumers. The hydroelectric plant can be completed in about 18 months. The City Commission has declined to consider the proposal at this time, as the plant is not finished and ready to carry out any contract that might be made.

Pacific and Mountain States

ARLINGTON, WASH.—The Washington Coast Utilities Company has been granted a franchise by the Snohomish County Commissioners to erect electric transmission lines through eight townships in the north end of the county, covering in all about 200 miles of lines. The company will also supply electricity and water in this city.

CENTRALIA, WASH.—Arrangements have been completed by the Thomas Pulp & Paper Company, recently organized with a capital stock of $5,000,000, it is reported, for the erection of a 40,000-hp. power plant in Centralia. E. Thomas of Portland, Ore., is president and manager of the company.

NEWPORT, WASH.—The property of the Northern Idaho & Montana Power Company will be sold in Newport on Aug. 10 under a decree of foreclosure issued by the United States District Court. The sale includes property and contracts of the company at Eugene, Ore., central stations, transmission and service lines of the company running from Newport and serving Newport, Wash., Sandpoint, Priest River, Clarksfork, Hope and East Hope, Idaho.

NORTHPORT, WASH.—The Northport Light & Power Company, recently incorporated with a capital stock of $200,000, is planning to develop electric and gas plants in the State of Washington. The company proposes to furnish power for the Northport smelter and for mines and mills in this vicinity.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has been awarded contract for all outside wiring for the permanent cantonment at American Lake, including furnishing electricity for lamps and motors.

TACOMA, WASH.—An ordinance providing for an extension of the municipal street railway system from the city limits to the Todd shipyards on the tide flats, and for an issue of $180,000 in bonds, has been passed by the City Council.

TACOMA, WASH.—An ordinance has been introduced in the City Council for the purchase of a rotary converter, to cost $22,000, for use in connection with the municipal street car line. At present the city purchases its direct-current service from the Tacoma Railway & Power Company.

TACOMA, WASH.—Proposal for the purchase by the city of Tacoma of the Kaynor-Wright water-power site on the White and Green Rivers in Pierce and King Counties for $225,000 has been submitted to the City Council by W. P. Wood and George D. Livesley. The site, if developed, would have a capacity greater than the low-water capacity of the La Grande plant.

TACOMA, WASH.—A claim for 600 cu. ft. of water per second on the Nisqually River and on Mineral Creek, and a claim for the use of Mineral Lake for storage purposes has been filed by the city of Tacoma. The claim was filed with the ultimate idea of constructing an auxiliary electric power plant in duplicate of the present plant at La Grande, at a site on the upper Nisqually River about 5 miles above Elbe.

VANCOUVER, WASH.—Plans are being prepared by Julius Zittel of Spokane and D. Nichols of Vancouver, architects, for the erection of power plant, industrial workshop and schoolroom at the State School for the Blind in Vancouver, to cost about $40,000.

AUBURN, CAL.—The Bear River Water & Light Company, recently incorporated with a capital stock of $10,000, contemplates the construction of a large hydroelectric power plant on the Bear River. The incorporators are: J. W. Morgan and Daniel Kirby of Auburn, and Dr. J. L. Rollins of Colfax.

AZUSA, CAL.—The Railroad Commission has authorized the Southern California Edison Company to transfer its electrical distribution in Azusa to the municipality. The city has operated its own distributing system in part of the town and now will take over the entire system. It will purchase power from the Edison company.

LEMOORE, CAL.—All bids submitted for the installation of an electrolier lighting system and for other improvements have been rejected by the Board of Trustees. The bids exceeded the estimated cost by $10,000. Bids, it is understood, will be readvertised.

LOS ANGELES, CAL.—Bids will soon be asked for the construction of a new power house for the County Hospital. The building, 80 ft. by 90 ft., will be erected on Wood Avenue, directly back of the main hospital group, and will cost about $118,000. Work has resumed on new service building for the hospital.

OROVILLE, CAL.—Work will soon begin by the Great Western Power Company on the erection of a hydroelectric plant at Oroville, to cost about $6,000,000.

PALO ALTO, CAL.—An army cantonment will be built in Palo Alto by the United States government for which the following material will be required: About 2,000,000 ft. of insulated wire, 16,000 ft. of lamp cord, 8000 key sockets, 9000 shades, 10,000 cleat receptacles, 8500 snap switches and other electrical equipment.

SAN FRANCISCO, CAL.—Application has been filed by the California-Oregon Power Company with the California Railroad Commission for authority to sell its hydroelectric properties in Trinity County to the Estabrook Gold Dredging Company.

SONORA, CAL.—A special election will be held on July 31 to vote on the proposal to issue $45,000 in bonds to install a municipal electric-light plant and street-lighting system. The plans provide for complete system with underground wires.

VENTURA, CAL.—The Ventura County Power Company of Oxnard is installing an electric distributing system at Somis, at a cost of about $4,000.

GRACE, IDAHO.—The Utah Power Company contemplates the construction of a new 7-ft. penstock and 1000 ft. of 13½-ft. woodstave pipe line; also installing new units having a generating capacity of 11,000 kw., increasing the output of the plant to 44,000 kw.

THACHER, ARIZ.—At an election to be held July 30 the proposal to issue $18,000 for the installation of an electric-light plant and ice factory will be submitted to the voters.

BEAR CREEK, MONT.—The power house of the International Coal Company, it is reported, was recently destroyed by fire.

GREAT FALLS, MONT.—Plans have been completed for the erection of the proposed rod and wire mill, 125 ft. by 400 ft., to be erected by the Anaconda Copper Mining Company at Great Falls, to cost about $500,000.

TERRY, MONT.—The local electric-light plant has been purchased by A. A. Jonson of Winona, Minn., who, it is said, will change the system from direct to alternating current.

MEEKER, COL.—The property of the Meeker Electric Company (William Laidlaw, owner and manager), has been purchased by C. W. Grove, who will operate the plant under its present name.

LOVELOCKS, NEV.—The Nevada Valleys Power Company has applied to the Commissioners of Washoe County and to the City Council of Reno for a franchise to erect electric transmission lines in the county of Washoe and the city of Reno.

RENO, NEV.—The Truckee River General Electric Company is erecting a high-tension transmission line from Verdi to the Poeville mining district.

Canada

RENFREW, ONT.—The Town Council has decided to purchase the property of the Renfrew Power Company at $100,000.

SHERBROOKE, QUE.—The ratepayers have authorized an appropriation of $150,000 for the erection of an electric transmission line from Weedon to Sherbrooke and for the construction of a substation in Sherbrooke.

Record of Electrical Patents

Notes on United States Patents issued on July 10, 1917

1,232,863. CONTROL SYSTEM; Karl A. Simmon and Arthur J. Hall, Wilkinsburg, Pa. App. filed June 9, 1914. Adapted to compensate automatically for the inherent phase distortion and reduction of voltage of the phase converter under conditions of load, irrespective of whether it be a motor load or a generator load.

1,232,879. THERMIONIC AMPLIFYING CIRCUIT; Peter I. Wold, East Orange, N. J. App. filed Sept. 2, 1916. To make it possible to detect or measure such voltages or currents as could not otherwise be detected or measured by the instruments at hand.

1,232,908. LIGHT-TREATMENT APPARATUS; Ernest C. Feyrer, Erie, Pa. App. filed Feb. 26, 1917. For utilizing electric light for the treatment and relief of painful or congested conditions of the human body.

1,232,915. REGULATING DEVICE; Arthur J. Hall, Wilkinsburg, Pa. App. filed May 25, 1914. Particular reference to torque-operated devices for effecting the actuation of a drum controller or other device.

1,232,917. RADIATING CAR TRUCK; Arthur F. H. Head, Philadelphia, Pa. App. filed Feb. 15, 1917. Rigid methods of supporting the motors and brake mechanism in this character of trucks.

1,232,919. THERMIONIC VOLTMETER; Raymond A. Heising, East Orange, N. J. App. filed Sept. 7, 1915. Designed to measure the voltage between two points of an electrical network without taking power from that network and without introducing frequency errors.

1,232,925. CONTROL SYSTEM; Henry D. James, Wilkinsburg, Pa. App. filed Sept. 8, 1914. With special reference to alternating-current systems which employ single-phase sources of energy and polyphase dynamo-electric machines that are adapted to operate either as motors or as generators.

1,233,031. CONNECTING PLUG; Frank B. Cook, Chicago, Ill. App. filed Jan. 15, 1915. Relates to electric switches employing complemental parts in the form of spring jacks and conducting plugs.

1,233,062. AUTOMATIC CUT-OUT FOR ELECTRIC LINES; Robert Johansson, Gothenburg, Sweden. App. filed Sept. 30, 1916. For use as a substitute for the fuse plug cut-outs commonly used in house installations.

1,233,097. QUICK-BREAK SWITCH; Ralph K. Mason, Litchfield, Conn. App. filed Sept. 1, 1916. Improvements.

1,233,133. PERMUTATION SWITCH; Charles A. Short and Harry C. Dunning, Los Angeles, Cal. App. filed June 2, 1913. Designed for use in connection with the sparking circuit of an automobile.

1,233,137. X-RAY SYSTEM; Homer C. Snook, Philadelphia, Pa. App. filed April 13, 1909. Relates to a system and apparatus for delivering high-potential unidirectional current to an X-ray tube or other translating device or to a consumption circuit.

1,233,183. ELECTRICAL HEATING UNIT AND METHOD OF MAKING THE SAME; Wilber A. Carter and Sabin Crocker, Detroit, Mich. App. filed June 5, 1916. Designed for the heating of ovens to relatively low temperature.

1,233,188. OUTLET-BOX FITTING; Allan Coggenshall, Pleasantville, and Henry C. Schnake, New York, N. Y. App. filed Feb. 2, 1916. Fitting adapted to receive an attachment plug.

1,233,191. RESISTANCE UNIT AND METHOD OF MAKING THE SAME; Edgar F. Collins, Schenectady, N. Y. App. filed Dec. 29, 1916. Provision of a heater for air or other gases which is provided with a large radiating free circulation of the air to be heated therethrough.

1,233,192. CUT-OUT FOR ELECTRICAL CIRCUITS; Nicholas J. Conrad, Chicago, Ill. App. filed Oct. 16, 1915. Improvement.

1,233,196. AUTOMATIC RINGING AND SECRET-SERVICE TELEPHONE SYSTEM; Hiram D. Currier, Chicago, Ill. App. filed April 10, 1913. Improvement.

1,233,197. ELECTRIC TERMINAL; John Cuthbert, Chicago, Ill. App. filed Aug. 5, 1916. Will coil and clamp the wire or cable holding the threaded clamping members to prevent loosening.

1,233,199. SIGNALING SYSTEM; Philippo L. E. del Fungo-Giera, New York, N. Y. App. filed June 16, 1916. Indicates with certainty and accuracy the position of a ship, so that the direction and speed of such ship may be readily determined.

1,233,204. ELECTRIC BATTERY; Jay E. Dunn, Brooklyn, N. Y. App. filed Nov. 29, 1916. Comprising several cells disposed in a suitable container and connected in the required manner.

1,233,211. DEVICE FOR TELEGRAPHING UNDER WATER; Frank P. Fisher and Hugh Dehart, Radford, Va. App. filed Jan. 17, 1916. Transmitted through a body of water as a carrying medium without the necessity of a wire or metallic connection between the sending and receiving stations.

1,233,220. ELECTROMAGNETIC ORGAN ACTION; John A. Goodycz, Philadelphia, Pa. App. filed Feb. 17, 1915. Insures the action of the pallets or valves that control the ports between the wind box and the air channels communicating with the pipes.

1,233,232. WIND-WHEEL ELECTRIC GENERATOR; Albert H. Heyroth, Geraldine, Mont. App. filed Feb. 9, 1916. For use in connection with windmills in which the wheel thereof forms the rotor of the generator.